

**0674 Herp Ecology & Systematics, Ballroom B, Thursday 8 July 2010; ASIH
STOYE AWARD ECOLOGY & ETHOLOGY**

Jonathan Richardson

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**Fine-scale Adaptive Divergence of Wood Frog Populations (*Rana sylvatica*) in
Response to Habitat-mediated Selection**

There is increasing evidence that adaptive divergence among wildlife populations can occur over fine spatial and temporal scales. While much of the research into adaptive potential of populations has come from a few model systems, there are also data indicating that amphibians are capable of fine-scale evolution. In this study, I estimated the phenotypic divergence among populations of the wood frog (*Rana sylvatica*) that inhabit seasonal ponds. I performed a field-based reciprocal transplant experiment between pairs of neighboring open and closed-canopy ponds – pond types that present different selection pressures for amphibians. I evaluated the growth and development of larval wood frogs in both their natal and introduced habitats. Additionally, I used genetic assays to estimate divergence among the focal populations. I found strong evidence of phenotypic divergence between ponds of dissimilar canopy cover. Wood frog larvae originating from closed-canopy ponds were 27% heavier, 10% longer and developed faster than those originating from open-canopy ponds. These experimental results indicate that wood frog populations can diverge phenotypically over very small geographic scales. However, the genetic data show little genetic differentiation between populations within each pair. This could indicate that selection is intense and populations are able to diverge phenotypically in spite of high gene flow. Alternatively, these findings may suggest that adaptive divergence can occur quite rapidly as canopy coverage changes over time, and that the genetic markers used in this study do not diverge at the same rate as the phenotypic traits under direct selection.

0400 Poster Session III, Exhibit Hall D, Sunday 11 July 2010

Max Ringler, Eva Ursprung

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**A Low-cost Acoustic Location System to Analyse Individual Calling Activity
in a Population of *Allobates femoralis* (Aromobatidae)**

Territoriality of one or both sexes plays a vital role in the reproductive behaviour of Neotropical poison frogs and their relatives (Dendrobatoidea). In the pan-Amazonian species *Allobates femoralis* (Aromobatidae) males announce their all-purpose territories with distinct calls which also serve to attract females. The ability to monitor and analyse

the individual calling activity and the acoustic interactions of several males is essential for the investigation of correlates of female mate choice and male reproductive success in this species. We used a flexible, low-cost system, employing off-the-shelf hardware and open source software to record the calling activity in a community of vocalizing males and to infer their calling positions through a TDOA (time difference of arrival) analysis of their calls. The hardware part of the system consists of an outdoor-laptop (Panasonic Toughbook), a bus-powered 6-channel audio-USB interface (Emagic A62m) and omni-directional microphones (Sennheiser ME62). For simultaneous 6-channel recordings we used the audio recording and editing software Audacity 1.3.11 (<http://audacity.sourceforge.net>). The dynamic mathematics software Geogebra 3.2 (<http://www.geogebra.org>) was used for geometrical multilateration of the positions of callers by intersecting hyperbolas resulting from TDOA calculations.

0493 Poster Session I, Exhibit Hall D, Friday 9 July 2010

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Notes on the Geographic Distribution, Taxonomy and Natural History of *Dipsas pratti* Boulenger 1897 (Squamata: Dipsadidae)

In recent years, research on the taxonomy and systematics of South American snail-eating snakes of the genus *Dipsas* has increased considerably. However, many secretive species from northern South America remain poorly studied and knowledge of their behavior and natural history is still lacking. One of these snakes, *Dipsas pratti*, has a troubled taxonomic history complicated by the lack of natural history information about the species. After the description of *D. pratti* in 1897 four species of *Dipsas* were described and later determined to be ontogenetic variants of the species and therefore all synonymized. Although *D. pratti* has been labeled as the type species for a group, it is known in the literature from not more than ten specimens. At present, this species is only known from the Cordillera Central and Cordillera Oriental of Colombia. Here, we redescribe this species based on six specimens from Venezuela, the holotype, a cotype, and two additional Colombian specimens. The Venezuelan specimens were collected in the Sierra de Perijá, Zulia state, ca. 1600 m elev. These specimens represent the first records for Venezuela and the northern most localities for the species, extending the known range approximately ca. 300 km northeast from the nearest locality in the Cordillera Oriental of Colombia. Our data increase considerably the knowledge of this secretive snake and call attention to the discovery of many species, which inhabit regions poorly studied because of conflicts in unstable political borders of Colombia and Venezuela.

0509 Poster Session I, Exhibit Hall D, Friday 9 July 2010

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Distribution, Taxonomy, Hemipenial Morphology and Natural History of Two Poorly Known Species of *Anadia* (Gymnophthalmidae): *A. pariaensis* Rivas, La Marca and Oliveros 1999, and *A. steyeri* Nieden 1914

The microteiid genus *Anadia* currently contains 17 species with a collective distribution ranging from Costa Rica south to Pacific Ecuador and from Western Colombia to Eastern Venezuela. However and in spite of that many of the species are relatively well known, some of them are particularly rare, especially two Venezuelan species. One of these is *Anadia pariaensis*, described based in a sub adult male and until recently, the single specimen known, which was collected in the Peninsula de Paria, northeastern Venezuela. Another poorly known species is *A. steyeri*, known at mid altitudes in the Venezuelan Cordillera de la Costa and Sistema Lara-Falcón, with only four specimens reported in the literature since almost a century old. Herein we present new taxonomic data of both species, including the hemipenial morphology and remarks on natural history, based in a new specimen of *A. pariaensis* as a well as five new specimens of *A. steyeri*. The discovery and analyzes of those specimens increases substantially the taxonomy and systematic knowledge of both species. Despite both species presents some similar morphological characteristics, the examination of the hemipenes revealed very different organs. The hemipenis of *A. steyeri*, present some characteristics that resembles the organs of two species from Santa Marta Mountain of “*bitaeniata*-group” (*A. pulchella* and *A. altaserrania*). On the other hand, the hemipenes of *A. pariaensis* is unique within the genus, presenting exclusive and incomparable characteristics that will not allow us to allocate it in any of the groups proposed.

0011 Herp Ecology & Behavior, 555 AB, Saturday 10 July 2010

J. Dale Roberts

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Sperm Competition and Testis Mass Evolution: Intraspecific Tests in the Australian Frog *Crinia georgiana*

Mating behaviours consistent with the occurrence of polyandry, multiple males with a single female, have been reported in at least eight frog families: e.g. rhacophorids from Africa and Asia, Australian myobatrachids and phyllomedusine frogs from Central America. Genetic data on the outcomes of polyandrous matings are rare but limited data from surveys of egg masses and direct analysis of particular matings both suggest multiple-male amplexus leads to multiple paternity. Consequently polyandrous mating systems are subject to sperm competition. Comparative studies of testis mass across species of myobatrachid frogs have shown that sperm competition favours the evolution of larger testes and longer sperm assuming male proximity is a proxy for risk of sperm competition. We report an intraspecific test of these outcomes using the quacking frog, *Crinia georgiana*. We assigned parentage using 4 microsatellite markers and the program Gerud. We sampled egg masses in 10 populations and scored rates of polyandry for 4 - 13 egg clutches per site excluding clutches with > 1 mother. Our data show two critical results: i) rates of polyandry and male density are positively correlated ii) rates of polyandry and testis mass are also positively correlated. Between population variation in testis form is consistent with predictions of sperm competition theory and with previous cross-species analyses of sperm and testis evolution in myobatrachid frogs.

0660 Fish Systematics I, Ballroom D, Monday 12 July 2010

Luiz Rocha

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Genic Speciation and the Accuracy of the Molecular Clock

The genic view of speciation (GVS) states that speciation is driven by processes at the gene (not the individual) level, that genomes are not cohesive, but porous, and that gene flow during speciation is possible. According to the GVS, under a speciation with gene flow scenario, the genes that promote reproductive isolation and those that are influenced by disruptive selection should start diverging first, whereas neutral genes should flow freely between emerging species, generating a characteristic heterogeneity of genetic divergences among different regions of the genome. When speciation is driven entirely by isolation, the genomes of the incipient species should behave as a cohesive unit, and all genes should start diverging at approximately the same time. Thus, the GVS predicts that speciation with gene flow leaves a distinct and unique

genomic signature that can be differentiated from that of allopatric speciation. This observation has profound effects on the way we calculate divergence times using the molecular clock. Since most molecular clocks are calibrated by geological events that caused allopatric speciation (e.g.: the closure of the Isthmus of Panama), their application should be limited to speciation events that follow strict allopatric patterns. Here I identify three cases in which there is a large discrepancy between mtDNA and nuclear DNA divergences in species pairs separated by the Isthmus of Panama versus pairs where speciation with gene flow is likely to have occurred, what indicates that generalizations made applying molecular clocks calibrated using allopatric speciation events should be revisited.

0519 Poster Session II, Exhibit Hall D, Saturday 10 July 2010

Luiz Rocha, Moises Bernal, William Ludd

University of Texas at Austin, Port Aransas, TX, United States

Molecules and Morphology Indicate Speciation by Hybridization in a Marine Fish

Mechanisms that lead to speciation remain among the most debated topics in evolutionary biology, and sympatric speciation is especially difficult to demonstrate in nature. Because of their peculiar biogeography and their ability to produce sounds, fishes of the genus *Haemulon* serve as a great subject for tests of speciation hypotheses. Collectively known as grunts, the genus is comprised of 19 nominal species. Aiming to elucidate the phylogenetic relationships among the species of *Haemulon*, a combined total of ~2,000 base pairs from two mitochondrial genes (cytochrome b and cytochrome oxidase I), and two nuclear loci (TMO-4C4 and RAG2) were obtained from all nominal species. The closure of the Isthmus of Panama seems to have played a role in the diversification of *Haemulon*, however, many sister species pairs have completely overlapping geographical distributions, indicating that vicariance is not the only process driving speciation in this genus. Our data also indicates that the species *H. carbonarium* seems to have originated through a hybridization event between *H. macrostomum* and *H. flavolineatum*. These three species form a strongly supported group in the phylogeny, however, mtDNA groups *H. carbonarium* with *H. macrostomum*, whereas nuclear DNA groups *H. carbonarium* with *H. flavolineatum*. A detailed morphological analysis shows that many morphological characters in *H. carbonarium* are intermediate between *H. macrostomum* and *H. flavolineatum*, indicating a probable hybrid origin for *H. carbonarium*. If supported by additional ongoing high throughput genomic analyses, this will be the first case of sympatric speciation by hybridization in a vertebrate animal.

0225 Lundberg Symposium, Ballroom D, Sunday 11 July 2010

Marcelo Rocha

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Recent Advances in Pimelodidae Systematics

For a long time, the catfish family Pimelodidae had been composed of a group of catfishes without any known synapomorphy. This family also used to include integrants of the currently monophyletic Heptapteridae and Pseudopimelodidae; however the recognition of the Pimelodidae, as currently defined, was gradual. Nowadays the Pimelodidae comprises 30 valid genera containing around 100 described species. Some monophyletic groups within the family have been recognized in recent years. The group with the greatest number of species, and probably with the most problematic taxonomy is the Pimelodus group, comprising 11 genera and more than 30 species in the genus *Pimelodus*. The phylogenetic status of *Pimelodus* is dubious, and until today, no synapomorphy is known for its species. Species of *Pimelodus* are very widespread throughout the Neotropical region, and also present a great diversity of shape and color variation, making their taxonomic study challenging. Moreover, some taxa within the Pimelodus group are still poorly known, and only recently some of them have been studied in more detail, like *Bagropsis*, *Duopalatinus*, *Bergiaria* and some *Pimelodus* species. This group still includes the most recent species and genera discovered and described, and many small undescribed species, mainly from the deep water of the Amazon River. Recent collaborative work between South and North American researchers have increased the knowledge about these catfishes, and brought new insights into their relationships.

0258 Herp Conservation II, Ballroom B, Sunday 11 July 2010

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The Seduction of MaxEnt: Challenges in Identifying Sites Climatically Matched to the Native Ranges of Animal Invaders

Maximum entropy (MaxEnt) species distribution models are increasingly used to characterize a species' native range climate, so as to identify sites elsewhere in the world that may be climatically similar and therefore at risk of invasion by the species. A recent MaxEnt model of Indian Pythons (*Python molurus*) by Pyron et al. (2008) used this approach to reject the findings of our (Rodda et al. 2009) rule-based model identifying US sites at risk of invasion by the python. We re-analyzed the Pyron et al dataset in MaxEnt and concluded that their approach was inappropriate for extrapolating fundamental climate suitability to another part of the world. MaxEnt invoked minimal

protections against data dredging, multi-collinearity of explanatory axes, and overfitting. MaxEnt endeavored to identify a single ideal climate, whereas our rule-based method allowed different climatic considerations to determine range boundaries in different parts of the native range. MaxEnt was extremely sensitive to choice of pseudo-absences for the python, with radically different portions of the US identified as suitable depending on the area from which pseudo-absences were drawn. MaxEnt was also extremely sensitive to choice of presence points: inclusion of just four erroneous localities in the Pyron et al dataset was responsible for their conclusion that a very small area of Florida is at risk of python invasion. The observed MaxEnt model instability and lack of statistical protections against overfitting, multi-collinearity, and data dredging may combine with a failure to distinguish fundamental from realized climate envelopes to produce models of limited utility.

0181 Poster Session II, Exhibit Hall D, Saturday 10 July 2010; NIA BEST STUDENT POSTER AWARD

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Stream Fish Fauna Structure in Three Basins of the Brazilian "Cerrado"

The fish assemblage structure in 19 streams of the Paraguay (PG), Paraná (PN) and São Francisco (SF) basins was evaluated with the objective to detect seasonal (dry x wet periods), conservation (more x less degraded) and environmental influences (hydrological, physicochemical, % of mesohabitat, ecotonal, and internal descriptors). Low similarity in species composition between pair of basins was registered (CBSPG-PN=0.14, CBSPN-SF=0.23, CBSSF-PG=0.11). Abundance was higher in PG (n=4674) than in PN (n=2486) and SF (n=2005) (ANOVA, p=0.02), with highest abundances in the dry season (p=0.01). Other quantitative measures like species richness, abundance and diversity index didn't vary in relation to conservation status nor between periods. Overall structure analysis (MDS with Cluster and ANOSIM) identified four groups of streams (p=0.001, R=0.819). Three groups represented by river basins with differences in conservation status (PG: p=0.001, R=0.305; PN: p=0.001, R=0.559; SF: p=0.001, R=0.451), but not in seasonality (p > 0.05). A fourth group (called "buritizal") is represented by streams with a specific physiognomy and fish fauna. No indicator species of conservative status was detected for PG or SF, but *Astyanax altiparanae* in PN was significantly related to degraded group (p=0.035). Canonical Correspondence Analysis revealed that streams and their fish fauna exhibited distinct features; PG streams had highest conductivity, flow and surface area; PN had highest turbidity, deep and % of runs; SF had highest % of pools, ecotonal and internal diversity. These results show that changes in environmental features presumably affect differently fish assemblage structures and, consequently, generalizations about these influences must be avoided.

0458 Headstarting Turtle Symposium II, Ballroom B, Monday 12 July 2010

Willem Roosenburg, Nick Smeenk

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Comparison of Head-start and Wild Release Hatchlings from the Poplar Island Environmental Restoration Project

The Poplar Island Environmental Restoration Project is a > 400 hectare restoration project in Chesapeake Bay rebuilding Poplar Island, which had eroded and subsided to less than 4 hectares. Diamondback terrapins (*Malaclemys terrapin*) nest on sandy slopes of the perimeter dike and hatching success is high because raccoons and foxes have not colonized the island. Since 2004, approximately 200 hatchlings per year were distributed to elementary schools in Maryland where they over-winter and are head-started. Additionally, each year we catch and mark 1200 - 1500 natural hatchlings and release them at the time of emergence. Head-started animals reach sizes similar to those of 2 - 5 year old individuals from Chesapeake Bay. All animals are notch-coded and tagged with an internal binary coded wire tag. All head-started animals are also PIT tagged prior to their release in the following spring. In 2009, we initiated mark-recapture methods to recapture marked hatchlings. Recapture rates have been low but equal of both head-started and natural released animals. Among the head-started animals, we did not detect any advantage for large sized animals at the time of release. The findings of this study are preliminary and we anticipate including data from our 2010 field season.

0393 Poster Session I, Exhibit Hall D, Friday 9 July 2010

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Locomotor Kinematics of an Axially Undulating Batoid (*Narcine brasiliensis*)

Electric rays differ from other batoids because they do not appear to generate thrust using the body disc (modified pectoral fins), and instead use an axially undulating tail. In order to characterize this distinctive swimming mode and test the putative non-locomotor function of the disc, we examined 10 juvenile rays of the species *Narcine brasiliensis*. Using speed as a measure of performance, we tracked kinematic variables of the tail and body disc during axial undulation of the tail (straight swimming), and during gliding swimming (downward coasting). We predicted that the tail would be important for modulation of speed in straight swimming and that the disc would be important as the primary speed and distance modulator during gliding. However, stepwise linear regression showed that although tail features, especially tail beat frequency, were significant predictors of speed during undulation, disc pitch was also

an important contributing factor. Gliding speed and distance were modulated using the tail to maneuver during downward coasting. This result is similar to gliding in other fish and land animals. We found that gliding speed and distance were also controlled by disc pitch. Based on our results, we revised our original prediction and we propose that electric rays use their discs and pelvic fins to control body attitude and glide characteristics. This work was supported by NSF DBI-0442269 and IOS-0922605.

0228 HERPETOLOGISTS' LEAGUE GRADUATE STUDENT AWARD, 556 AB, Friday 9 July 2010

Sara Ruane¹, Robert Bryson, Jr.², Frank Burbrink¹

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Gene Tree/Species Tree Discordance within *Lampropeltis*

Phylogeographic analyses often reveal cryptic species within widespread taxa. Most of these studies rely on mitochondrial gene (mtDNA), resulting in a gene tree estimate rather than a species tree for the taxa of interest. Here, we estimate gene trees and species trees to examine the most widespread serpent in the New World, the milk snake (*Lampropeltis triangulum*), using both a mitochondrial gene and multiple, independent, single-copy nuclear loci (scnDNA). Using Maximum Likelihood and Bayesian inference we construct gene trees using mtDNA and compare them to a species tree estimated using scnDNA. We consider not only milk snakes in our analyses, but include all members of the genus *Lampropeltis* to determine phylogenetic placement. Both gene trees and species trees indicate that milk snakes are not monophyletic with respect to other species within *Lampropeltis* and, with the exception of *L. elapsoides*, none of the traditionally recognized milk snake subspecies form reciprocally monophyletic clades. Three distinct milk snake lineages occur in the United States, with at least five more occurring in Central and South America. We discuss causes of discordance between gene trees and species trees; these incongruous results further emphasize the importance of utilizing multiple, independent loci when inferring phylogenetic relationships.

0421 Roads Symposium I, Ballroom B, Saturday 10 July 2010

William C. Ruediger

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Using Expert-Based/GIS Wildlife Habitat Connectivity Processes to Assess Wildlife and Aquatic Organism Concerns on Proposed Highway Projects

Twenty years ago, it was a rarity for State DOTs (Department of Transportation) to consider wildlife mortality, habitat loss or habitat connectivity as part of planning processes. Today, many DOTs address wildlife and aquatic organism habitat connectivity routinely and several states have implemented wildlife crossings and other mitigation measures. There remains a void between DOTs and resource agencies as what the ecological issues are, how to address these issues and what specific mitigation is required. State DOTs are allocated large portions of budgets with the expectation that highways will be improved and projects implemented on time. Resource agencies are often confused as to how and when to provide input into highway projects, or what mitigation measures are appropriate. Consequently, some DOTs and resource agencies may not effectively communicate or coordinate on these issues. The result can be delays in legitimate highway projects, costly wildlife mitigation measures or lost wildlife, aquatic organism or native plant mitigation opportunities. Expert-based/GIS wildlife habitat connectivity assessment is an evaluation tool that can be applied to specific highway segments, entire highway lengths or even entire state highway systems. The process uses existing GIS-based resource information and the knowledge of natural resource and transportation agencies, conservation groups and citizens interested in conserving wildlife resources. The process has been used successfully to assess highways in several states and has reduced highway project implementation delays, reduced planning and development costs, and has resulted in implementation of effective wildlife crossings and other wildlife, aquatic organism and native plant mitigation measures.

0445 Herp Conservation I, 556 AB, Thursday 8 July 2010

Francheska Ruiz-Canino

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A New Way to Mark Small Amphibians

Mark recapture studies are important to understand populations and how they change in time. Finding a suitable mark for the species of interest is a very important part of the study. Small animals present a challenge as most techniques are either designed for large animals or are way too expensive to make a mark recapture study cost efficient. For amphibians the challenge is even greater as no technique that involves the surface of

the skin can be applied as frogs breathe and absorb water from the environment through their skin. One way to overcome this obstacle is my new technique developed with a native frog of Puerto Rico *Eleutherodactylus antillensis*. This new technique consists of inserting fluorescent tattoo dye in the hind limbs of the frogs on both the ventral and dorsal side with a small insulin needle. The tattoo dye is approved for human use and was originally developed for marking fish of commercial fisheries. From a single color you obtain a total of 10 combinations and 12 combinations when applying two colors with no more than two injections per individual. During a twenty-two month study marking the small frog (~28mm) the technique does not seem to affect survival of individuals as individuals have been found with the marks up to 12 months after its application and juveniles have been found as adults months later. This new technique will allow the application of mark-recapture studies to small animals which allows for better and more complete populations studies.

0292 Amphibian Ecology, 551 AB, Monday 12 July 2010

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Antipredator Mechanisms in Larval Anuran Communities

Predation is known to be a major factor in structuring aquatic amphibian communities. Anuran larvae possess a variety of antipredator mechanisms that allow them to cope with predation pressure in a myriad of environments. Primary antipredator mechanisms are used by anuran larvae to avoid detection from predators. Sometimes, encounters with predators are inevitable, especially in predator rich environments, and anuran larvae must employ secondary antipredator mechanisms to avoid predation once they have been detected. We examined 12 species of anuran larvae and determined the types of defenses and the relative quality of each defense for each species. Also, we examined 50 different wetlands to determine predator regime and larval anuran community composition. Then, we attempted to determine if traits such as activity level, swimming burst speed, palatability, cover use, and escape path complexity could be used to predict a species' membership within specific communities. While preliminary analyses suggest that, both, primary and secondary antipredator traits, exhibited by many anuran species, are associated with particular predator regimes; community membership for some species was not predictable based on the traits we measured.

0288 Poster Session II, Exhibit Hall D, Saturday 10 July 2010

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Occurrence of *Batrachochytrium dendrobatidis* on Amphibians from Eastern Texas

The amphibian disease chytridiomycosis, caused by the pathogenic fungus *Batrachochytrium dendrobatidis* (*Bd*), is well known as a major threat to amphibians resulting in mass die-offs and population declines throughout the world. *Batrachochytrium dendrobatidis* has been detected on amphibians from sites across North America including the Southeastern United States but there have been no reports of *Bd* from amphibian populations in East Texas. We sampled amphibians for the presence of *Bd* in four geographically disjunct sites in eastern Texas (approximately 31° N latitude) to determine *Bd* infection rates in areas not previously surveyed. Also, we attempted to determine which species might be at greatest risk to *Bd* in this region. Overall, we sampled a total of 266 adult amphibians of 18 different species, from 8 different families. Of these 18 species, 6 had at least one individual that tested positive for *Bd*. Thirteen of the 266 individuals tested positive for an overall detection rate of 4.8%. Though the fungus is present in the southeastern United States, including East Texas, to our knowledge no amphibian declines have been attributed to chytridiomycosis in this region.

0639 AES Conservation & Management, 552 AB, Friday 9 July 2010

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An Investigation on the Effect of Photoperiod and Temperature on Vertebral Band Deposition in Little Skate, *Leucoraja erinacea*

An investigation was undertaken to determine whether photoperiod or temperature have an effect on the timing of vertebral band pair deposition in captive young-of-the-year (YOY) little skate, *Leucoraja erinacea*. The experimental design consisted of a randomized complete block split plot design with two factors: temperature and light. Temperature was nested within light and therefore four variables were tested: (1) constant light, (2) constant temperature, (3) seasonal light, and (4) seasonal temperature. For 18 months, little skate experienced accelerated seasonal conditions of temperature

and light to mimic 3 years of growth. This study provides primary and supporting evidence that seasonal photoperiod and temperature, respectively, have no effect on timing of vertebral band pair deposition in captive little skate. Vertebral analysis of seven surviving skates showed that all produced 1 to 1.5 band pairs regardless of treatment over 18 months. Centrum edge analysis of 56 specimens provided evidence that the timing of winter and summer band deposition was not affected by treatments. The winter band (translucent) appeared in February 2007 and January 2008 while the summer band (opaque) showed up in July for both 2007 and 2008 and mimicked patterns observed in the wild. While temperature and photoperiod appear to have no effect on timing of band pair deposition in YOY little skate, other mechanisms which may influence band deposition should be investigated including the effect of food ration and the presence of a circa-annual rhythm and/or hormone secretion.

0753 Fish Evolution, 555 AB, Saturday 10 July 2010

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Test of Vicariant Speciation on the Andean Catfish Genus *Chaetostoma* (Siluriformes: Loricariidae) in Southeastern Peru, Based on Morphological and Genetic Evidence

Most *Chaetostoma* species have restricted geographic distributions, and many of them are known only from their type locality. *Chaetostoma lineopunctatum* has been collected from central and southeastern Peru, specifically from Ucayali and Madeira River tributaries, which are separated by a chain of young mountains (the Fitzcarrald Isthmus). Our aim was to detect the presence of at least two cryptic species identified as *C. lineopunctatum* by quantifying morphological and molecular divergence based on caliper measurements and partial cytochrome b sequences (801 bp), respectively. Morphological divergence was statistically significant in the MANOVAs by locality ($P < 0.025$) and by basin ($P < 0.025$), but the groups could not be discriminated by basin with 100% confidence. Furthermore, neighbor-joining trees of specimens grouped by locality (based on Mahalanobis distances) did not show group patterns according to basin. The divergence values between haplotypes from the Ucayali River and the Madeira River ranged from 1.1% to 1.5%, which was similar to the 1.2% divergence among haplotypes found within the Ucayali River. We concluded that there is not enough evidence to consider these three populations as different species, based on the absence of morphological traits that can discriminate geographic populations and the low levels of genetic divergence.

0567 Fish Ecology, Morphology & Physiology, 556 AB, Saturday 10 July 2010

André Luís Sanches, Mônica Ceneviva-Bastos, Lilian Casatti

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Do Food Web Parameters Vary According to Substrate Type? Evidences from Brazilian Streams

One of the central issues in ecology is to understand the nature of species interactions and determine its influences over community patterns and dynamics. In this context, food webs can provide useful portraits of ecosystem functioning. Despite that, little is known about the influence of physical habitat on food web parameters. Aiming to investigate whether food web parameters vary according to substrate type, three streams were sampled, one of which predominantly sandy, another rocky, and another silty; all inserted in the same forest fragment. Sampling included algae, macrophytes, plankton, macroinvertebrates, and fish, as well as habitat physical attributes. The diet of all heterotrophic taxa was determined. The number of links, link density, intermediate species, preys, predators, maximum chain length, and trophic levels were higher in the rocky stream. The sandy stream presented intermediate values of food web parameters and the silty one displayed the lowest, except for the number of top species (since all trophic species were very close to the base and many had no predators). In the silty stream, homogeneous substrate sustained a poorer community compared to the others, but some trophic species like *Cricotopus*, *Thienemanniella*, *Americabaetis* and *Simulium* were dominant, being the most eaten items, indicating that feeding preferences, especially for fish species, was mostly determined by resource density. Overall, the results indicated that stream bottom composition and its distinct heterogeneity degrees can affect community composition, complexity and stability, for it is a relevant factor to species occurrence, distribution, and trophic interactions.

0378 Poster Session II, Exhibit Hall D, Saturday 10 July 2010

Barbara Sanchez, Mark Steele

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A Comparison of Growth and Condition of *Paralabrax nebulifer* (barred sand bass) from Polluted and Unpolluted Sites in Southern California

Environmental stressors can have detrimental effects on fish populations by limiting the abilities of individuals to acquire resources for growth, reproduction and survival. Pollutants such as PAH's, PCB's and heavy metals can cause physiological stress in fishes, especially in areas of high pollutant concentrations, such as is commonly found in harbors. This study evaluated the impacts of pollutants on growth and condition of a common coastal marine fish in Southern California. *Paralabrax nebulifer* (barred sand

bass) is one of the most frequently caught fishes in the recreational fishery in Southern California. This demersal species occupies a variety of habitats, including kelp beds, sand flats, inland harbors, and bays. This study was conducted at four sites: two polluted sites within harbors (Los Angeles/ Long Beach and San Diego Harbor) and two relatively unpolluted sites located outside of harbors (Ventura Flats and Barn Kelp). Fish were collected during the non-spawning season and length, body weight, liver weight, gonad weight, and the presence of fin deformations were recorded. We compared growth (size at age from otoliths), condition factors (K), hepatosomatic index (HSI), and gonadosomatic index (GSI).

0259 Fish Systematics I, Ballroom D, Monday 12 July 2010

Michael Sandel¹, Peter Unmack², Phillip Harris¹

¹*University of Alabama, Tuscaloosa, AL, United States*, ²*Brigham Young University, Provo, UT, United States*

Phylogenetic Affinities and Interrelationships of Centrarchidae and Elasmomatidae: A Synthesis of Molecules, Morphology and Biogeography

North American sunfishes (Centrarchidae) and pygmy sunfishes (Elasmomatidae) are the only freshwater percomorph families endemic to the Western Hemisphere. Their phylogenetic affinities have implications upon our understanding of the colonization history and vicariance processes responsible for continental patterns of freshwater biodiversity. A potential sister group relationship between the two families has been argued for decades, due primarily to their sympatric distribution and similar morphology. Recent molecular phylogenies have suggested ties between one or both families to temperate freshwater percomorphs from East Asia (Sinipercidae) and/or the Southern Hemisphere (Percichthyidae). Morphologists previously suggested such transcontinental relationships, but synapomorphies are apparently insufficient to elicit taxonomic recognition. This study is the first to address the problem using complete taxonomic sampling for all four families. Using the cytochrome b gene, we examine the effects of taxonomic sampling bias on the MP and ML topology, a factor likely to account for discordant interfamilial relationships among published mtDNA trees. A secondary objective of this study is to explore the limit of phylogenetic resolution for five mitochondrial genes, and provide a consensus phylogeny upon which hypotheses of vicariance and morphological synapomorphy are tested. We reconstruct ancestral sequences in order to improve the probability of homology among rapidly evolving mtDNA characters, and test intergeneric relationships with preliminary nuclear data. Sinipercidae is recovered as the sister group to Centrarchidae. A monophyletic Centrarchidae+Elasmomatidae is rejected, as is Percichthyidae (sensu Nelson 2006). The sister group relationship to Elasmomatidae is not supported by mtDNA analysis, but a novel hypothesis is presented.

0478 Karel Liem Symposium II, Ballroom D, Friday 9 July 2010

S. Laurie Sanderson

College of William & Mary, Williamsburg, VA, United States

Fish Versus Industrial Crossflow Filtration

Suspension-feeding fish, such as tilapia, goldfish, and shad, have been identified as the only vertebrates that have evolved crossflow filters. When fluid is pumped parallel to a crossflow filter, the filtrate exits through the filter pores while the retained particles are concentrated as they travel downstream. We use a miniature fiberoptic endoscope to quantify particle movement inside the oral cavities of live suspension-feeding fish. These data, combined with computational fluid dynamics simulations in fish oral cavities, permit a comparison between biological and industrial crossflow filtration. Multi-billion dollar industrial crossflow systems for biomedical and pharmaceutical processing, beverage preparation, and wastewater treatment are limited by pore blockage and the eventual deposition of particles that foul the filter. Relative to industrial crossflow processes, the filter pores are larger in fish, the channel length is shorter, and particles do not accumulate on fish filtration surfaces. Fish routinely retain particles that are small enough to be lost with the filtrate, and these particles rarely contact the filter surface as they are transported directly to the esophagus for swallowing. The surfaces of the branchial arches alone function as a crossflow filter when the gill rakers have been removed experimentally. Microthermistor flow probes to quantify pre-pump and post-pump flow reversals during feeding indicate that oscillatory flow may reduce particle deposition on the branchial arches. Ongoing experimental and computational studies are focusing on features of fish crossflow filtration that enable fish to maintain high pore Reynolds numbers and high permeation flux with no fouling of the filter.

0733 Turtle Ecology & Conservation, 555 AB, Friday 9 July 2010

Franziska Sandmeier, C. Richard Tracy, Bridgette Hagerty, Hamid Mohammadpour, Sally DuPré, Kenneth Hunter

University of NV, Reno, Reno, NV, United States

Natural and Acquired Antibodies to *Mycoplasma agassizii* in the Mojave Desert Tortoise: Implications for Managing a Wildlife Disease

This is the first range-wide analysis of the prevalence of upper respiratory tract disease (URTD) and seroprevalence of a known, etiological agent, *Mycoplasma agassizii*, in the Mojave desert tortoise (*Gopherus agassizii*). We analyze this host-pathogen system from the viewpoint that this is a potentially complex disease, with varying dynamics over

both space and time. We focus on population-level analyses ($n = 24$), and test for associations among prevalence of URTD, seroprevalence to *M. agassizii*, mean and standard deviations of levels of natural antibody to *M. agassizii*, genetics of tortoise populations, mean annual winter precipitation, and mean number of days below freezing. We detected significant associations between mean number of days below freezing and both prevalence of URTD and seroprevalence to *M. agassizii*. Furthermore, we detected a significant association between mean levels of natural antibody and seroprevalence to *M. agassizii*. Genetics of tortoise populations was associated with mean levels of natural antibody. We propose hypotheses, concerning possible ecological and evolutionary dynamics of the desert tortoise – *M. agassizii* system, based on these associations. We present recommendations for future research to address tests of these hypotheses.

0532 Herp Systematics & Biogeography, 551 AB, Saturday 10 July 2010

Marites Sanguila¹, Cameron Siler², Arvin Diesmos³, Olga Nuñez⁴, Rafe Brown²

¹*Fr. Saturnino Urios University, Butuan City, Mindanao, Philippines*, ²*University of Kansas Biodiversity Institute, Lawrence, Kansas, United States*, ³*National Museum of the Philippines, Manila, Luzon, Philippines*, ⁴*Mindanao State University, Iligan City, Mindanao, Philippines*

Molecular Phylogeography, Species Boundaries, and Conservation Status of Southern Philippine River Toads

Taxonomists have long considered Philippine toads of the genus *Ansonia* an unremarkable pair of species from the southern portion of the archipelago. The most recent taxonomic assessments have considered Mindanao populations to be two minimally differentiated species: *A. muelleri* from eastern Mindanao Island, and *A. mcgregori* from the western portions of the island. The most recent IUCN assessment classified both Philippine *Ansonia* as “Vulnerable” because of specific threats to their preferred habitat, but the presumed widespread distribution of the two species prevented their elevation to higher threat categories. We used molecular phylogeographic analyses of two mitochondrial gene regions to investigate species boundaries of these Mindanao river toads. Our data strongly reject the hypothesis of two species (with an east-west split between them) and instead diagnose a minimum of between four and eight highly divergent evolutionary lineages that we presume will be recognized as species. The majority of the putative species breaks are associated with low elevation valleys of Mindanao, suggesting that the complex topography of the island has contributed to the evolutionary process of diversification. Our data emphasize the need to reevaluate the conservation status of many Southeast Asian amphibians in order to move away from “expert opinion” conservation assessments. Instead we urge conservation biologists to incorporate new phylogeographic studies, population genetic approaches, and distributional data from recent field surveys into

conservation status assessments of Southeast Asia's rich and highly endemic amphibian fauna.

0751 Poster Session I, Exhibit Hall D, Friday 9 July 2010

Ralph Saporito¹, Monica Isola², Vivian Maccachero², Keith Condon³, Maureen Donnelly²

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Ontogenetic Scaling of Poison Glands in a Dendrobatid Poison Frog

The nature of chemical defenses in poison frogs has been explored in a variety of species, and most studies focus on the type of chemical defense and its source. The defensive compounds of frogs are stored in dermal granular glands that have been described for several species that are chemically protected from predators and/or microorganisms. Gland ultrastructure is known for nine species of dendrobatoid frogs, but the relationship between body size and chemical defense has not been explored. It might be expected that the capacity for defensive protection increases as a function of body size, especially given the fact that juvenile poison frogs are known to have smaller quantities of alkaloids than adults. We examined poison glands histologically in a sample of the poison frog *Oophaga pumilio* to determine if the physical basis of the defensive system changes as a function of body size. We measured average gland size, estimated the number of glands, and calculated the density and percentage of skin area occupied by glands in a patch of dorsal skin for 25 individuals. The size, number, and percentage of skin area occupied by poison glands increased allometrically as a function of body size, whereas poison gland density decreased with body size. Adults have a larger capacity to store alkaloids and more of their dorsal skin is associated with poison glands as compared to juveniles, which may translate into greater predator avoidance of adults. Furthermore, juveniles and subadults may benefit from automimicry because they resemble adults in appearance.

0069 Roads Symposium II, Ballroom B, Saturday 10 July 2010

Raymond M. Sauvajot¹, Amy Pettler², Seth P. D. Riley³

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Protecting Wildlife Habitat Linkages Through Collaborative Science, Transportation Planning, and Roadway Design Near Los Angeles, California

For over a decade, the National Park Service (NPS), California Department of Transportation (Caltrans), and other organizations have worked together collecting, analyzing, and sharing data about regional wildlife movement corridors in parks and open space near Los Angeles, California. Scientific studies include radio telemetry of coyotes, bobcats, and mountain lions, genetic assessments of carnivores, birds, and reptiles, monitoring undercrossings and culverts to evaluate wildlife utilization, assessing wildlife mortality along roads, and GIS analyses of potential wildlife movement corridors. Results from these studies demonstrate that regional wildlife viability will depend on protecting habitat linkages and wildlife movement corridors, and enhancing connectivity along roads that cross movement corridors. Caltrans, NPS, and other partners are now integrating scientific information with on-the-ground actions. Collaborative efforts include identifying priority sites for enhancements, installing wildlife-proof fencing along roads, enhancing existing culverts and undercrossings for wildlife movement, and conducting monitoring both before and after improvements to evaluate effectiveness. We demonstrate that by sharing expertise and experiences, and by linking science and planning, regional habitat connectivity can be enhanced in combination with transportation projects. We are now working to apply this model of partnership and collaboration to other areas facing similar wildlife conservation and transportation challenges.

0277 Poster Session I, Exhibit Hall D, Friday 9 July 2010; AES CARRIER AWARD

Rachel Scharer¹, William F. Patterson III¹, John K. Carlson²

¹*University of West Florida, Pensacola, FL, United States*, ²*NOAA, National Marine Fisheries Service, Southeast Fisheries Science Center, Panama City, FL, United States*

Preliminary Age Estimates of the Endangered Smalltooth Sawfish of South Florida

The US population of smalltooth sawfish, *Pristis pectinata*, is currently listed as endangered under the Endangered Species Act. Basic life history data critical for

conservation are lacking for this species. To address the lack of life history information, we have begun a project to examine the usage of vertebrae and rostral teeth for aging smalltooth sawfish. Vertebrae and rostral teeth were collected from naturally deceased fish (n=8) in southern Florida. Transverse sections were made through vertebral centra and were read with transmitted light under a stereo-microscope. No staining was required due to the clearly defined opaque and translucent zones in vertebral sections. Each section was read independently by two readers without any prior knowledge of fish size. If counts differed between readers, age was assigned by consensus. Size of aged fish ranged from 600mm to 4327mm total length, and age estimates based on vertebral sections was zero to ten years. Age validation currently is being explored through examination of calcium and trace metal concentrations across vertebral sections with laser ablation-inductively coupled plasma-mass spectrometry. Lastly, longitudinal sections of rostral teeth are being examined to explore whether analysis of rostral teeth may provide an accurate non-lethal aging method.

0547 Poster Session II, Exhibit Hall D, Saturday 10 July 2010

Robert Schelly, Zachary Baldwin, John Sparks

American Museum of Natural History - Ichthyology, New York, NY, United States

Madagascar's Nearshore Marine Fishes: Depauperate Fauna or Inadequate Sampling?

Madagascar's nearshore marine fish fauna has traditionally been considered to be low in diversity and more or less similar to that of the east African coast. Results of recent survey work along the Masoala Peninsula in northeastern Madagascar indicate that this notion is incorrect and attributable to both a lack of adequate sampling and ineffective sampling techniques. A variety of shallow nearshore habitats were sampled along the Masoala Peninsula over a month-long period in 2003, including exposed fore reef, reef crest, back reef, lagoon, and rocky bay sites. Using only snorkeling gear and rotenone, over twice as many species as previously reported to occur in this region were collected, including numerous taxa new to science. In addition, many additional pelagic taxa were observed, but not collected. Faunal inventory studies of marine fishes in Madagascar have frequently relied only on visual surveys. Our results indicate that this approach is ineffective and greatly underestimates true ichthyofaunal diversity for a number of reasons, which are discussed below.

0412 AES Genetics, 552 AB, Sunday 11 July 2010

Jennifer V. Schmidt¹, Chien-Chi Chen², Saad I. Sheikh¹, Mark G. Meekan³, Bradley M. Norman⁴, Shoou-Jeng Joung²

¹University of Illinois at Chicago, Chicago, IL, United States, ²National Taiwan Ocean University, Keelung, Taiwan, ³Australian Institute of Marine Sciences, Crawley, WA, Australia, ⁴Ecocean Inc., Cottlesloe, WA, Australia

Paternity Analysis in a Litter of Whale Shark Embryos

The reproductive biology of the whale shark (*Rhincodon typus*) is poorly understood on all levels. A 10.6 meter female whale shark caught off the coast of Taiwan in 1995 carried more than 300 embryos in her uteri, ranging in developmental stage from embryos still in egg cases, to hatched, near-term animals. This litter established that whale sharks develop by aplacental yolk-sac viviparity, and the range of developmental stages within the litter indicated ongoing fertilization over an extended period of time. This suggested that embryos of varying ages might have been sired by different males. Recently published microsatellite markers for *R. typus* have now allowed paternity investigation in a subset of 29 embryos from this female. The embryos available for analysis represent ~10% of the initial litter, and span nearly the full range of size and developmental stage. Genetic analysis determined that all embryos are likely to be full siblings sired by a single male. These data suggest that female whale sharks may be capable of long-term sperm storage after a single mating event, which may be a physiological adaptation to the limited mating opportunities available in a species that segregates by sex and age, and likely exists at low density in the open ocean. No tissue was available from the female for genetic analysis, but a 1222 nucleotide region of the maternally-inherited mitochondrial control region was sequenced from the embryos, identifying a novel haplotype most similar to two haplotypes previously isolated from the western Indian Ocean.

0798 Poster Session II, Exhibit Hall D, Saturday 10 July 2010

Ray Schmidt, Henry Bart Jr.

Tulane University, New Orleans, LA, United States

Phylogeography and Taxonomy of the Barbs (Cyprinidae: 'Barbus') from Guinea, West Africa

Species of the genus 'Barbus' occupy a variety of habitats throughout tropical Africa, Europe, the Middle East and Asia. Recent work revealed that 'Barbus' was polyphyletic throughout its range but other workers have been identifying monophyletic groups within the genus. This study involves specimens of 'Barbus' collected throughout

Guinea, West Africa on multiple expeditions in 2002 and 2003. The collecting effort was focused on the Fouta Djallon Highlands, Zone Forestière and coastal streams. The Fouta Djallon serves as the headwaters of many of the largest rivers in West Africa; the Zone Forestière and coastal watersheds harbor some of the last remnants of tropical rain forest within Guinea. Although some taxonomic work has recently been completed in this area, there are still many unresolved questions surrounding the ichthyofauna of Guinea and surrounding countries. Results of a phylogenetic analysis involving cytochrome b gene and Growth Hormone Intron 3 sequences from roughly 100 '*Barbus*' specimens collected from throughout the area has revealed a number of taxonomic issues in need of resolution, as well as, the presence of previously unknown species. We compare our '*Barbus*' results with those of other recently studied taxa from the region to search for common biogeographic patterns.

0760 Poster Session II, Exhibit Hall D, Saturday 10 July 2010

Susana Schonhuth¹, Michael J. Blum², David A. Neely³, Lourdes Lozano-Vilano⁴, Hector Espinosa⁵, Anabel Perdices⁶, Richard L. Mayden¹

¹*Saint Louis University, Saint Louis, Missouri, United States*, ²*Tulane University, New Orleans, Louisiana, United States*, ³*Tennessee Aquarium Research Institute, Cohutta, Georgia, United States*, ⁴*Universidad Autonoma de Nuevo Leon, Nuevo Leon, Mexico*, ⁵*Universidad Nacional Autonoma de Mexico, Mexico DF, Mexico*, ⁶*Museo Nacional de Ciencias Naturales, Madrid, Spain*

Biogeographic Perspective on the Evolution of *Campostoma ornatum* (Actinopterygii: Cyprinidae) in Western Mexico

The Mexican Stoneroller, *Campostoma ornatum*, is the most poorly known member of the genus *Campostoma*. This polytypic taxon shows remarkable morphological variation throughout its unique distribution, which is restricted to a wide geographic region in southern North America dominated by the Sierra Madre Occidental. The aim of this study is to examine genetic variation across the range of the Mexican Stoneroller, and use these data to assess phylogenetic relationships among currently independent populations and determine potential historical processes and geological mechanisms for dispersal and vicariance across the complex range of the species. Methods: 183 specimens from 80 different localities representing the range of this species were collected for the genetic analyses. Phylogenetic analyses were performed independently for one mitochondrial (cytochrome b) gene and one nuclear (intron S7) gene. Phylogenetic trees were estimated for each data set using Maximum Likelihood (ML) and Bayesian Inference (BI). Results: Phylogenetic analyses consistently resolved a monophyletic *Campostoma ornatum* and recovered two well-supported clades within the species that exhibit marked differentiation. Currently, this species is found in 10 independent drainages in Northern Mexico, which are not recovered as independent lineages. Main conclusions: Results from different phylogenetic analyses found high levels of genetic divergence between two main lineages that consistently suggest ancient

isolation of southern drainages. Analyses indicated a range expansion through Pacific drainages from the ancestral Rio Grande System, and also suggested recent admixture by secondary contact through headwater connections in several regions of the SMO.

0193 Herp Systematics & Biogeography, 551 AB, Saturday 10 July 2010

Aaron Schrey¹, Kyle Ashton², J. Steve Godley³, Earl McCoy¹, Henry Mushinsky¹

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Genetic Analysis Identifies Two Major Barriers to Gene Flow within the Florida Sand Skink's Distributions

The threatened Florida Sand Skink (*Plestiodon reynoldsi*) occurs on three central highland ridges of scrub habitat in Florida. This habitat has been severely altered and now primarily exists as small preserved patches. We explored the pattern of range-wide genetic differentiation with both DNA sequences and microsatellite loci to determine the relationship among extant scrub patches. Two previous studies identified population structure among Florida Sand Skinks and found this structure follows the geological history of central Florida. We expand these findings by focusing our analysis on determining what factors created the observed structure. Thus, we targeted our sample collection to characterize the margins of Florida Sand Skink genetic groups. Our results identify two major barriers to gene flow in the Florida Sand Skink's range. One divides Florida Sand Skink on the Mt. Dora Ridge from those on the Lake Wales Ridge and appears to be generated by a barrier to gene flow. The other divides Florida Sand Skinks from the Lake Wales Ridge into central and southern segments. Our genetic results, and the geography in this region, indicate that there is a restricted avenue for dispersal south on the Lake Wales Ridge.

0694 Poster Session II, Exhibit Hall D, Saturday 10 July 2010

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An Isolated and Differentiated Population of *Gasterosteus aculeatus* (Gasterosteidae: Gasterosteiformes) from Nueltin Lake in Northwestern Manitoba

Gasterosteus aculeatus, the three-spined stickleback, is a small anadromous fish species that is well known for rapid morphological and molecular differentiation of populations

over post-glacial timeframes. In northern Manitoba, Canada, *G. aculeatus* is considered to be uncommon in the coastal drainages into Hudson Bay, and is usually found within 75km of the coast. We describe an apparently distinct population of this species from Nueltin Lake, Manitoba, near the border with Nunavut that is over 250km from the coast. This population is not likely to be anadromous. Although not morphologically remarkable, analyses of 12 microsatellite loci provide high F_{st} values for the Nueltin Lake population compared to populations downstream in the Thlewiaza River as well as those in other Hudson Bay coastal drainages ($F_{st}=0.18$ to 0.48). We suggest that the Nueltin Lake population is a post-glacial relict, isolated as a result of isostatic rebound. This distinct population of *G. aculeatus* in northwestern Manitoba should be considered for special conservation status as have unique populations of this species elsewhere in Canada. Other aquatic organisms in Nueltin Lake should be investigated for evidence of similar post-glacial isolation and differentiation.

0806 Herp Systematics, 551 AB, Monday 12 July 2010

James A. Schulte II¹, Derek E. Wildman², James R. Stewart³, Zhuo-Cheng Hou³, Amy L. Weckle³, Michael B. Thompson⁴

¹Clarkson University, Potsdam, NY, United States, ²Wayne State University, Detroit, MI, United States, ³East Tennessee State University, Johnson City, TN, United States, ⁴The University of Sydney, Sydney, NSW, Australia

Comparative Analysis of Placental Transcriptomes in an Australian Viviparous Skink, *Pseudemoia pagenstecheri*

Complex, integrated traits such as viviparity (live birth) evolve through the interaction of developmental-genetic networks in the context of historical selective conditions. Viviparity occurs in two modern amniote lineages, mammals and squamate reptiles (lizards and snakes) and remarkably has evolved independently more than 100 times in squamates. In mammals, the genetic mechanisms underlying pregnancy are relatively well-known but little is known in squamates. Advances in next-generation sequencing technologies have greatly facilitated the generation of extensive comparative gene expression datasets. We sequenced the transcriptome from two embryonic stages in the viviparous scincid lizard, *Pseudemoia pagenstecheri*. The goals of this study were several fold but for brevity we will discuss gene comparisons with those expressed in mice and human placentas; and identify unique *Pseudemoia* transcripts compared to other genomically well-characterized vertebrates. Significant differences and similarities in gene regulation occurred between the two developmental stages and specific functional pathways involved in this shift will be discussed. There also were a large number of gene transcripts expressed in mouse and human placentas expressed in the skink transcriptomes, as well as several species-specific transcripts expressed in *Pseudemoia*. These data greatly increase our knowledge of genes expressed in one viviparous squamate lineage and highlight the necessity more extensive comparative sampling from other viviparous and oviparous species at a variety of developmental stages.

0116 Herp Ecology & Behavior, 555 AB, Saturday 10 July 2010

Joshua Schwartz, Brandon Lentine, Raymond Hunce, Jennifer Noviski

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Tests for Call Restoration in the Gray Treefrog, *Hyla versicolor*

Phonemic restoration, a form of temporal induction, occurs when the human brain compensates for masked or missing portions of speech by filling in obscured or non-existent sounds. We tested for temporal induction and related abilities in females of the gray treefrog, *Hyla versicolor*. Pulse number (call duration) is used by females for assessment of males. Accordingly, an ability to "restore" or interpolate between masked or otherwise sonically degraded portions of calls could help females during mate choice in noisy choruses. In phonotaxis experiments, we employed unmodified calls and those that had centrally placed gaps, regions overlapped by portions of other calls or filtered noise, or replaced with filtered noise. When offered call alternatives with equivalent numbers of clear pulses, we found that females discriminated against calls with gaps two or more times greater than the natural 25 ms interpulse interval. When gaps were replaced with zones of call overlap or noise (so, again the call durations of the alternatives were unequal), females discriminated either in favor (overlap) of the modified stimuli or failed to discriminate (noise). However, when the unmodified and modified stimuli were the same duration, females discriminated against the latter. Pulses formed from noise bursts were attractive, but less so than normal pulses. Our results therefore do not indicate that females of the gray treefrog employ a form of temporal induction that is fully restorative. However, the data indicate that acoustically anomalous sections of calls can retain attractive potential provided acoustic energy and pulses are present.

0683 Herp Ecology & Behavior, 555 AB, Saturday 10 July 2010

Christopher Searcy¹, Levi Gray², H. Bradley Shaffer¹

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Mass-dependent Survival and Dispersal in the California Tiger Salamander (*Ambystoma californiense*)

Due to the fossorial nature of ambystomatid salamanders, few studies have captured these species away from their breeding ponds. This has made it difficult to learn about demography and metapopulation dynamics among non-breeding stages of this group. Using a drift-fence array that stretches up to one kilometer from the edge of their breeding pond, we investigated survival between non-breeding stages of the California tiger salamander and dispersal of this species into the terrestrial environment. Tracking

individual salamanders was made possible through the use of a pattern recognition program and subdermal alphanumeric tags. Implanting 2,335 metamorphs and photographing 3,114 adults and juveniles yielded 850 recapture events. These data revealed that larger individuals are more likely to survive between years during both the adult and juvenile stages, and are more likely to reach maturity from the juvenile stage. In addition, larger metamorphs disperse farther from the breeding pond. The importance of these trends is seen in the fact that average metamorph mass in the 18 cohorts examined in this study varied almost threefold between 5.3 g and 15.86 g. Thus, the average individual in the largest cohort has a 16-fold higher probability of surviving to maturity and will disperse 667 m further from the breeding pond than the average individual in the smallest cohort. This will introduce huge temporal variation into the population dynamics of this species, with certain cohorts having a much higher probability of contributing individuals to future generations and contributing dispersers to neighboring breeding ponds.

0077 Fish Genetics & Biogeography, 556 AB, Friday 9 July 2010

Greg Seegert, Joe Vondruska

EA Engineering, Science & Technology, Deerfield, IL, United States

The Distribution of Fishes Near Eight Power Plants on the Ohio River During the Winter

For three successive winters, we monitored the distribution of fishes near eight power plants on the Ohio River to determine to what extent various species were attracted to the thermal discharges from these plants and how the abundance and distribution changed compared to our standard spring, summer, and fall monitoring. Fish were collected by electrofishing and seining (two years only). Our results showed that catches were generally lower during the winter. Catches were typically highest immediately downstream of each plant's discharge where water temperatures were warmest. Downstream catches were highest at those plants where the temperature rise above ambient was greatest. Although catches of most species declined in the winter, winter catches of some species (e.g., sauger and smallmouth buffalo) were often higher during the winter compared to the other seasons.

0670 Herp Conservation II, Ballroom B, Sunday 11 July 2010

Richard Seigel¹, M. Rebecca Bolt², Stephanie Weiss²

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Preparing for the Inevitable: Anticipated Sea Level Rise and the Impacts on Reptiles and Amphibians at the Kennedy Space Center, Florida

One of the key concerns associated with global climate change is the subsequent rise in sea levels. Sea levels are increasing world-wide, but have risen almost 15 cm more than the global average along the U.S. mid-Atlantic and Gulf coasts. Impacts from rising sea levels are manifested in many ways, including beach erosion, flooding of low-lying areas, and increased salinity of freshwater and groundwater sources. The Kennedy Space Center (KSC), located on the east-central Florida coast, is an area which is considered to be highly vulnerable to future sea level changes. These changes not only have the potential to impact several billion dollars in national assets of the U.S. space program, but could also directly and indirectly affect some of the 69 species of amphibians and reptiles that occur on KSC, several of which are Threatened or Endangered. In this paper we review some of the likely impacts of sea level rise, with emphasis on possible management solutions that need to be developed and tested before the impacts become severe. Examples of possible management strategies include (a) increased use of beach hatcheries to mitigate loss of natural nests in sea turtles (loggerheads, green sea turtles, and leatherbacks) and (b) testing whether terrestrial species that inhabit the beach strand (e.g., gopher tortoises and indigo snakes) can make use of corridors leading to more protected habitats inland of the beach. Our overall message is that early testing and evaluation of management options are essential.

0353 Herp Conservation I, 556 AB, Thursday 8 July 2010

Erin Seney¹, Andre Landry, Jr.¹, Benjamin Higgins², Shanna Kethan³

¹*Sea Turtle and Fisheries Ecology Research Laboratory, Texas A&M University at Galveston, Galveston, Texas, United States*, ²*NOAA Fisheries Sea Turtle Facility, Southeast Fisheries Science Center, Galveston, Texas, United States*, ³*Lee High School, Baytown, Texas, United States*

Incidental Hook-and-Line Capture of Sea Turtles Along the Upper Texas Coast During 2004-2008

Five species of federally-protected sea turtles occur seasonally in the northwestern Gulf of Mexico, putting them at risk for interactions with commercial and recreational fisheries. We examined the incidental capture of sea turtles on recreational hook-and-

line gear along the upper Texas coast in 2004-2008. Fishing piers were contacted annually, and informational posters were placed at piers and other venues to promote reporting of hook-and-line-caught turtles. Reported turtles were transported to and held at NOAA Galveston. Radiography, examination, and appropriate procedures were conducted at the Houston Zoo's veterinary clinic. Forty Kemp's ridleys (*Lepidochelys kempii*), four loggerheads (*Caretta caretta*), and one green turtle (*Chelonia mydas*), were retrieved after hook-and-line capture in Galveston and Jefferson Counties. Eight ridleys were caught by surf fishermen, one ridley was caught from a nearshore boat, and the remaining turtles were retrieved from three privately-owned piers. Twenty ridleys were hooked in the mouth or jaw, whereas 18 ridleys and 3 loggerheads were throat-hooked or swallowed the hook. Two ridleys and one loggerhead were flipper-hooked, and the green turtle was hooked in the back of the neck. One ridley died after hook-removal surgery, and the remaining turtles were released following necessary treatment. Although captures by surf fishermen were probably under-reported, incidental hook-and-line captures represented 28% of documented non-nesting encounters of ridleys in Galveston and Jefferson Counties. Public outreach efforts should be expanded to target not only pier-based fishing, but all recreational anglers, in order to facilitate hook removal and determine the full extent of these potentially lethal interactions.

0470 Herp Development, 556 AB, Sunday 11 July 2010

Stanley K. Sessions¹, Brandon Ballengée²

¹*Department of Biology, Hartwick College, Oneonta, New York, United States,* ²*School of Computing, Communications, and Electronics, University of Plymouth, Plymouth, United Kingdom*

Limb Deformities in Amphibians: Developmental Mechanisms

Hind-limb deformities (extra limbs or missing limbs) in natural populations of amphibians have been an important environmental issue for more than a decade. The role of parasites (trematodes) as proximal causes of extra limbs and associated deformities is by now well established. On the other hand, recent evidence suggests that deformities featuring missing limbs (the most commonly reported deformities) are caused by "selective predation". Here we show that, in both cases, the observed deformities can be explained by the known characteristics and mechanisms of amphibian limb development and regeneration in response to mechanical perturbation.

0382 Herp Systematics & Biogeography, 551 AB, Saturday 10 July 2010

Brian Shamblin¹, Karen Bjorndal², Alan Bolten², Campbell Nairn¹

¹Warnell School of Forestry and Natural Resources, University of Georgia, Athens, Georgia, United States, ²Archie Carr Center for Sea Turtle Research, University of Florida, Gainesville, Florida, United States

Phylogeography and Population Structure of the Southern Greater Caribbean Green Turtle Rookeries Revisited with Expanded Mitochondrial Sequencing

Analyses of sequence polymorphism within a portion of the mitochondrial control region have supported the presence of several demographically independent green turtle (*Chelonia mydas*) rookeries in the Greater Caribbean region. However, extensive sharing of haplotypes among nesting populations has limited inferences about colonization pathways and demographic connectivity among some rookeries. Moreover, broad overlap of haplotypes among rookeries has limited the resolution of mixed stock analyses of foraging aggregations. We screened the mitochondrial genome of several nesting green turtles carrying control region haplotype CM-A5 and representing the rookeries of Aves Island, Suriname, and Tortuguero to determine whether additional informative variation occurred outside of the established control region fragment. Despite extensive sequence conservation, we identified four single nucleotide polymorphisms (SNPs). Screening of these SNPs in 115 CM-A5 individuals resulted in four mitogenomic haplotypes that were strongly partitioned among rookeries. Pairwise F_{ST} comparisons and exact tests of population differentiation support the demographic independence of Aves and Suriname, highlighting the need to manage the smaller Aves rookery as a distinct management unit. The presence of the ancestral haplotype at all three rookeries and absence of derived variants in the Suriname rookery suggests that Suriname is likely the source of the CM-A5 lineage that has colonized northward and westward through the Greater Caribbean region. Sequence determination at the SNPs identified in the present study should improve resolution of mixed stock analyses. Mitochondrial screening in search of rookery-informative variation for the remaining common Greater Caribbean haplotypes, CM-A1 and CM-A3, is underway.

0087 Headstarting Turtle Symposium I, Ballroom B, Monday 12 July 2010

Donna Shaver¹, Charles Caillouet, Jr.², Andre Landry, Jr.³

¹National Park Service, Padre Island National Seashore, Corpus Christi, Texas, United States, ²Retired, Montgomery, Texas, United States, ³Texas A&M University at Galveston, Department of Marine Biology, Galveston, Texas, United States

Experimental Head Starting of Kemp's Ridley (*Lepidochelys kempii*) Sea Turtle: A Large Scale Case Study

Kemp's ridley (*Lepidochelys kempii*) is the smallest and most endangered of the sea turtles. Its nesting epicenter is near Rancho Nuevo, Tamaulipas, Mexico bordering the western Gulf of Mexico, but it is also native to Padre Island National Seashore (PAIS) near Corpus Christi, Texas, the Gulf of Mexico, the eastern U.S. coast, and European Atlantic waters. As part of a Mexico-U.S. recovery program, experimental head starting of Kemp's ridleys was initiated in 1978 to establish a secondary nesting colony at PAIS in case other recovery efforts failed. The experiment encompassed numerous phases including collecting and incubating eggs, imprinting hatchlings, transporting eggs and hatchlings, captive rearing to sizes thought capable of avoiding most predators at sea, tagging, releasing, analyzing tag-returns, and documenting nestings. Related research was also conducted. Approximately 24,000 head started and tagged Kemp's ridleys of the 1978-2000 year classes were released into the Gulf of Mexico or adjoining bays, mostly in the western Gulf, but some were released off the west coast of Florida and in Campeche Bay. They joined the natural population and were vulnerable to the same natural and anthropogenic threats affecting wild Kemp's ridleys. Some nested, and these were the first head started sea turtles documented nesting in the wild. This paper covers collecting and incubating eggs, imprinting hatchlings, transporting eggs and hatchlings, estimating age at maturity in the wild, and documenting nestings, foraging, and post-nesting movements. A companion paper by Caillouet et al. (2011) covers captive rearing, tagging, releasing, analyzing tag-returns, captive-breeding, and related research.

0541 Fish Behavior/Acoustics, 555 AB, Sunday 11 July 2010

Katherine Shaw¹, Susan Foster²

¹*University of Connecticut, Storrs, CT, United States*, ²*Clark University, Worcester, MA, United States*

Geographic Variation in the Presence of the Sneaker Repertoire and Sneak Fertilization Propensity in the Threespine Stickleback (*Gasterosteus aculeatus* L.)

It is increasingly evident that the prevalence of alternative reproductive tactics may vary among populations of a given species, likely due to the interplay between environmental heterogeneity and tactic success. The presence of alternative reproductive tactics may lead to altered effectiveness of female choice, changes in the operational sex ratio (ratio of sexually active males to females), and may facilitate maintenance of genetic variation thereby influencing population genetics. Potential for interpopulation differences in the frequency of alternative reproductive tactics should be considered when quantifying and interpreting selection pressures and fitness measures. Here we report geographic variation in the presence of the sneaker repertoire and propensity to sneak fertilizations in wild populations of threespine stickleback. It is likely that sneaking fertilizations is a plesiomorphic character within the stickleback clade, as similar behaviors have been observed in other Gasterosteids and this behavior has been observed in the field, lab or inferred from genetic analyses in populations spanning the holarctic distribution of the threespine stickleback. However, our observational field studies suggest the sneaker repertoire is absent in a number of freshwater populations in coastal British Columbia although the behavior has been observed at low frequencies in several anadromous populations in adjacent areas. Anadromous and freshwater populations in south-central Alaska also exhibit variation in the frequency of sneak attempts during all observed courtships, ranging from 0 to 45%. Potential implications of observed interpopulation variation in alternative reproductive tactics within the stickleback adaptive radiation and the context-dependent nature of the sneaker repertoire will be discussed.

0163 AES Feeding Symposium I, 552 AB, Saturday 10 July 2010; AES GRUBER AWARD

David Shiffman¹, Gorka Sancho¹, Bryan Frazier², John Kucklick³, Dan Abel⁴, Tracey Sutton⁵, Kristene Parsons⁵

¹College of Charleston Graduate Program in Marine Biology, Charleston, SC, United States, ²South Carolina Department of Natural Resources, Charleston, SC, United States, ³Hollings Marine Laboratory, Charleston, SC, United States, ⁴Coastal Carolina University, Conway, SC, United States, ⁵Virginia Institute of Marine Science, Gloucester Point, VA, United States

Stable Isotope Analysis of the Sandbar Shark, *Carcharinus plumbeus*: A Minimally Invasive Method for Comparison of Diet and Trophic Relationships between Genders, Locations, and Age Classes

The 2006 National Marine Fisheries Service SEDAR for large coastal sharks recommended the gathering of additional diet and trophic relationship data for the sandbar shark, *Carcharinus plumbeus*. No diet studies of any kind have been performed on South Carolina subpopulations of *C. plumbeus*, and stable isotope analysis has never been performed on this species. Muscle samples were taken from *C. plumbeus* caught by the South Carolina Department of Natural Resources and the Virginia Institute of Marine Science shark surveys. The analysis of $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ from this muscle tissue is ongoing and will be compared with prey species and between other *C. plumbeus* samples to determine the diet and trophic level of South Carolina and Virginia subpopulations. Intra-subpopulation comparisons will be made to detect potential differences in diet and trophic level between sharks of different age classes and genders.

0036 Poster Session I, Exhibit Hall D, Friday 9 July 2010

Bindesh Shrestha, Robert Javonillo, John Burns, Akos Vertes

George Washington University, Washington, DC, United States

Unique Protein Identified in a Characid Gill Gland

Gill glands develop from anterior gill filaments of the first gill arches during sexual maturation of males in a number of genera of characid fishes. During development, secondary lamellae shorten, while epithelial tissue grows over the space between adjacent gill filaments, resulting in the formation of chambers that retain ventral openings into the main gill cavity. All gill glands are characterized by enlarged columnar cells between adjacent secondary lamellae. Light microscopy occasionally reveals stainable material within the lumens of the gill gland chambers. Transmission electron microscopy shows the presence of abundant membrane-bound secretory

vesicles within the cytoplasm of the columnar cells. Because gill glands appear to be secretory and restricted to sexually mature males, it is hypothesized that they release a chemical signal that somehow affects mating. Laser ablation electrospray ionization mass spectrometry (LAESI-MS) has been successfully utilized for the direct analysis of living tissues and single cells from plants and animals. We used this technique to analyze male gill glands and unmodified gill tissue in both sexes of the bloodfin tetra, *Aphyocharax anisitsi* (Characiformes: Characidae). A protein of 11,386 Daltons was identified in the male gill glands that was absent from adjacent unmodified gill tissue in males or unmodified female gill tissue in the same location as the gill gland in males. Further analysis will attempt to determine the amino acid sequence of this protein so that additional studies can be performed to establish its function.

0059 Herp Development, 556 AB, Sunday 11 July 2010

Dustin Siegel, Robert Aldridge

Saint Louis University, St. Louis, MO, United States

Sexual Kidneys in Salamanders

Few vertebrates are currently recognized as having kidneys with secondary sexual function. In gasterosteids (sticklebacks), the highly secretory region of the ventral kidney ducts produces a protein called “spiggin” that is the major constituent of the foam nests of stickleback fishes. Because of its androgen dependence, the production of spiggin in the stickleback kidney has become an important quantifiable biomarker for reprotoxic chemicals in aquatic environments. In squamates, and possibly all lepidosaurians, the highly secretory sexual segment of the kidney (SSK) is formed in either the distal nephron tubules or collecting ducts, and has multiple hypothesized functions. Historical studies on squamates also describe an SSK in salamanders from citation of work by Aron (1924). However, unlike the numerous articles on the squamate SSK and the spiggin-producing kidney of sticklebacks, practically no literature exists on a SSK in salamanders. In this presentation we review the historical literature, the possible implications, and the phylogenetic distribution of kidneys with secondary sexual function in salamanders.

**0387 SSAR SEIBERT SYSTEMATICS & EVOLUTION/SSAR SEIBERT
PHYSIOLOGY, 555 AB, Friday 9 July 2010**

Cameron Siler, Rafe Brown

University of Kansas, Lawrence, Kansas, United States

**Historical Processes Behind Patterns of Limb Reduction and Loss in an Island
Radiation of Fossorial Lizards**

The transition from quadrupedal to limbless body plans has occurred repeatedly in numerous independent lineages of squamates. However, only four genera of lizards possess both fully limbed and limbless species. The known species-level diversity of skinks of the genus *Brachymeles* is concentrated in the Philippines, with species exhibiting a full range of limb development, including fully-limbed, intermediate, and limbless forms. To investigate the process of limb reduction and loss, we conducted a comprehensive phylogeographic analysis of *Brachymeles* using a multi-locus dataset and particularly dense geographic sampling. We measured several morphological characters and used these to analyze patterns of body form evolution across the clade. Given an historical phylogenetic framework, we tested the polarity of evolutionary change in body form, estimated the number of times limbs have been lost in *Brachymeles*, and surveyed morphological changes associated with limb reduction. Our results indicate that limb-reduction and loss has occurred independently multiple times in *Brachymeles*. Additionally, it is clear that the species diversity within the genus is vastly underestimated. The genus *Brachymeles* is an excellent model system to address a variety of hypotheses related to body form evolution, miniaturization, limb reduction and loss, and correlated character evolution.

0100 Acoustics Symposium II, Ballroom D, Saturday 10 July 2010

Andrea Simmons, Mary Bates, Jeffrey Knowles, James Simmons

Brown University, Providence, RI, United States

Spatial Location Affects Vocal Interactions in Chorusing Bullfrogs

Our understanding of vocal interactions in large, dense frog choruses is limited by the accuracy of single-microphone techniques commonly used to record chorus activity. We developed a novel, multiple-microphone array to identify and classify vocal interactions in five natural bullfrog (*Rana catesbeiana*) choruses. Our results show that vocalizing males were not randomly spaced within these choruses, but tended to cluster together into closely-spaced groups of two to five individuals. There were non-random, differing patterns of vocal interactions within these clusters of closely-spaced males and between different, spatially separated clusters. Bullfrogs located within a cluster tended to overlap or alternate call notes with two or more other males in that same cluster.

These near-simultaneous calling bouts produced advertisement calls with more pronounced amplitude modulation than occurred in non-overlapping notes or calls. Bullfrogs located in different clusters more often alternated entire calls or overlapped only small segments of their calls. These males also tended to respond sequentially to calls of males in farther neighbors compared to those in nearer clusters. Results of computational analyses showed that the observed patterns of vocal interactions were significantly different than expected on the basis of random activity. These data suggest that chorusing males may both cooperate and compete with their neighbors, and that spatial separation is a significant factor modulating chorus activity.

0643 Poster Session I, Exhibit Hall D, Friday 9 July 2010

Navasha Singh, Robert Espinoza

California State University, Northridge, Northridge, CA, United States

Green Guts are Great(er): Dietary Correlates of Lizard Digestive Tract Gross Morphology

Plant tissues are less nutritious and energy rich and harder to digest than animal tissues. Consequently, herbivorous vertebrates have evolved specializations in their morphology, physiology, and behavior that compensate for the challenges imposed by eating plants. For example, herbivorous lizards are widely considered to have specialized guts to facilitate the digestion of plant matter. But the gut morphology has been characterized in a relatively small number of lizard species (primarily herbivores) precluding broad generalizations linking form to function. We examined the external gross morphology of the guts of >25 herbivorous, >20 omnivorous, and >50 carnivorous/insectivorous species of lizards ($n > 200$). Our sample spans the breadth of lizard diversity and represents 12 independent origins of herbivory. The area of each gut segment (stomach, small intestine, and large intestine) was traced and estimated using ImageJ software. We tested the ways in which the gross gut morphology of herbivores has diverged from the ancestral carnivore condition and whether the guts of omnivores are intermediate using conventional statistics (ANCOVA) and phylogenetically based analyses. Our hypotheses that herbivores would have larger guts and that omnivores would be intermediate were generally supported. Stomach area: herbivores > omnivores = carnivores; small intestine area: herbivores > omnivores > carnivores; and large intestine area: herbivores > omnivores = carnivores. Our study supports the general hypothesis that as the proportion of dietary plant matter increases over evolutionary time, the size and capacity of lizard guts also increase to facilitate the digestion of plant tissues.

0093 Fish Community Ecology, 555 AB, Monday 12 July 2010

Shankul Singh-ngam, Narongrit Deesud, Jenjit Khudamrongsawat
Mahidol University, Bangkok, Thailand

The First Official Record of an Invasive Sucker Mouth Armored Catfish (*Pterygoplichthys pardalis*: Loricariidae) in Klong Na-Kluea, Pattaya City, Thailand, and its Habitat and Reproductive Characteristics

Pterygoplichthys pardalis has become a problem in Thailand for many years but no studies have been conducted. The invasion of this species was human-introduced based on an interview with local people. The habitat and reproductive characteristics of this invasive catfish in Klong Na-Kluea, the ditch of Pattaya City, were studied. The distribution of catfish appeared to be related to physical characteristics of habitat and water chemistry, especially salinity. Although *P. pardalis* can live only in freshwater, some individuals might be able to tolerate and survive in brackish water, especially the juveniles that were found 200 m from the ocean. However, *P. pardalis* could not live in the ditch with very high salinity because high mortality was found when seawater invaded the freshwater areas. Collections of specimens indicated the reproduction of this species had already begun in June 2009 when the first sampling was conducted and continued to January 2010 when the last sampling was done. Mean standard length was 21 cm (max 40 cm; min 4.5 cm). Positive correlation between log standard length and log body wet weight was observed. Average clutch size was 2,993 oocytes per female. Sex ratio was 1:1. Nesting sites were also found. Comparisons with other invasive catfishes in other countries showed some similarities, especially high fecundity outside their native habitat.

0463 Herp Conservation III, Ballroom B, Sunday 11 July 2010

David Skelly

Yale University, New Haven, CT, United States

Hermaphrodites in the Suburbs: The Landscape Ecology of Amphibian Intersex

The occurrence of intersex characteristics in amphibians has been linked to pesticide exposure in the laboratory and, within natural populations, proximity to agricultural activity. But, overall, the natural history of amphibian intersex is poorly studied and its occurrence in many landscape types and regions is unknown. We offer the first analysis of the frequency of amphibian intersex across a range of land covers representing the major landscape types within a region. We used remotely sensed information to characterize land cover surrounding more than 6000 potential sampling locations within the Connecticut River Valley. From among these, we selected 23 sites to collect postmetamorphic green frogs (*Rana clamitans*) from 4 land cover types: undeveloped,

agricultural, suburban, and urban. Collected males were preserved and then prepared gonadal tissue samples were screened for the presence of testicular oocytes. A total of 233 animals was examined. Thirteen % of all male green frogs had gonads containing testicular oocytes. Sexual abnormalities were not randomly distributed among sites or landscape types. No abnormal individuals were found in undeveloped sites. While 7% of individuals from agricultural sites had testicular oocytes, corresponding frequencies for suburban and urban sites were 21 and 18% respectively. In the first examination of amphibian intersex in suburban and urban contexts, we find that these developed landscapes may be hotspots for abnormal sexual development. While underlying mechanisms nominated for agricultural landscapes may also apply to suburban and urban landscapes, our findings suggest that other mechanisms also merit consideration.

**0214 SSAR SEIBERT SYSTEMATICS & EVOLUTION/SSAR SEIBERT
PHYSIOLOGY, 555 AB, Friday 9 July 2010**

Phillip L. Skipwith, Aaron M. Bauer, Todd R. Jackman

Villanova University, Villanova, PA, United States

Molecular Phylogenetics of New Caledonian Diplodactylid Geckos

Diplodactylid geckos represent the most species-rich tetrapod lineage endemic to the South Pacific island of New Caledonia. They are a morphologically diverse group comprising approximately 70 species, many still undescribed, in five highly divergent genera. The monophyly of this clade within the Diplodactylidae is well supported by molecular data and the smaller genera *Dierogekko*, *Eurydactylodes*, and *Oedodera* are all strongly supported as monophyletic by all loci examined to date. The species-rich *Bavayia* is also monophyletic, but relationships among species in the most distinctive genus, *Rhacodactylus* (New Caledonian giant geckos), remain unclear. We used the mitochondrial gene ND2 and several nuclear genes varying in their evolutionary rates (RAG1, PDC, KIF24, and KIAA1549) to investigate the phylogeny of *Rhacodactylus*. None of the molecular markers supports the monophyly of the genus, but specific patterns of implied affinity differ significantly. ND2 data strongly suggests a sister relationship between *R. chahoua* and *Eurydactylodes* but none of the nuclear genes do. A sister relationship between *R. ciliatus* and *R. sarasinorum* was recovered by ND2 and KIAA1549, but not by other genes. In contrast to the strongly supported maximum likelihood phylogeny of ND2, all of the nuclear loci provide relatively poor support for the relationships of *Rhacodactylus* spp. they imply. The large degree of morphological divergence seen in this group appears to have occurred over a relatively short time period. Due to their comparatively slow evolution speed, even the fastest of the nuclear genes have been unable to resolve these relationships.

0158 AES Stress Symposium I, 551 AB, Sunday 11 July 2010

Gregory Skomal¹, John Mandelman²

¹MA Marine Fisheries, Vineyard Haven, MA, United States, ²New England Aquarium, Boston, MA, United States

Investigations into Physiological Stress in Elasmobranchs: A Historical Perspective

Elasmobranchs, like most fishes, are being subjected to an increasingly vast array of chronic and acute anthropogenic stressors. Although the physiological stress response in teleosts has been studied for decades, this research has lagged far behind in elasmobranchs. Of the limited number of studies conducted to date, most have centered on sharks subjected to capture and handling stress. This work has shown that sharks, like teleosts, exhibit primary and secondary responses to stress that are manifested in their blood biochemistry. The former is characterized by immediate and profound increases in circulating catecholamines and corticosteroids, which are thought to mobilize energy reserves and maintain oxygen supply and osmotic balance. Mediated by these primary responses, the secondary effects of stress in elasmobranchs include hyperglycemia, metabolic (e.g. lacticacidosis) and respiratory (hypercapnia) acidoses, and profound disturbance to ionic, osmotic, and fluid volume homeostasis. The nature and magnitude of these secondary responses are species-specific and may be tightly linked to metabolic scope and thermal physiology along with the type and duration of the stressor in question. Initial studies have also shown that the threshold to cope with, and recover from, various stressors, appears to vary interspecifically. Given the diversity of elasmobranchs, additional studies that characterize the nature, magnitude, and consequences of physiological stress over a broad spectrum of stressors are essential for the development of conservation measures. Due to K-selected life history characteristics in this group, additional studies on the sublethal impacts of various stressors on reproduction, immune function, and growth are particularly in need.

0315 Poster Session II, Exhibit Hall D, Saturday 10 July 2010

Peter C. Smiley Jr., Barry J. Allred

USDA-ARS Soil Drainage Research Unit, Columbus, Ohio, United States

Design and Management Criteria for Fish, Amphibian, and Reptile Communities within Created Agricultural Wetlands

Design and management criteria for created agricultural wetlands in the midwestern United States typically focus on maximizing the ability to process agricultural runoff. Ecological benefits for fish, amphibian, and reptiles are often secondary considerations. One example of this water quality focus is exhibited by the wetland-reservoir

subirrigation system (WRSIS) in northwestern Ohio. WRSIS is a agricultural water recycling system having one created wetland designed to process agricultural chemicals (filtration wetlands) and one created wetland designed to store subirrigation water (reservoir wetlands). Our objective was to compare fish, amphibian, and reptile communities between WRSIS wetland types to gain insights on how the created wetlands could be designed and managed to benefit fishes, amphibians, and reptiles. Fishes, amphibians, and reptiles were sampled by seining, hoop netting, and gee minnow trapping in three filtration wetlands and three reservoir wetlands in June of 2006, 2007, and 2008. A blocked two factor ANOVA coupled with the Tukey test was used to determine if differences in community structure occurred between wetland types and years. No difference in species richness, abundance, or percent reptiles occurred between wetland types. Percent amphibians was greater in filtration than reservoir wetlands. Percent fishes was greater in reservoir than filtration wetlands. Jaccard's similarity index scores ranged from 0 to 0.5 and indicated species composition was different between wetland types. Our results suggest the design and management of WRSIS wetlands needs to be altered so filtration wetlands are actively managed as amphibian habitat and reservoir wetlands are managed as fish habitat.

0314 Fish Conservation, Ballroom B, Friday 9 July 2010

Peter C. Smiley Jr., Kevin W. King, Norman R. Fausey

USDA-ARS Soil Drainage Research Unit, Columbus, Ohio, United States

Influence of Herbaceous Riparian Buffers on Fish and Amphibian Communities within Channelized Headwater Streams in Central Ohio

Herbaceous riparian buffers are a widely used conservation practice in the United States for reducing nutrient, pesticide, and sediment loadings in agricultural streams. The importance of forested riparian zones for headwater streams has been documented, but the ecological impacts of herbaceous riparian buffers have not been evaluated. Our hypothesis was that establishment of herbaceous riparian buffers adjacent to channelized headwater streams will alter the riparian habitat and geomorphology, which will then cause changes in water chemistry, instream habitat, fish communities, and amphibian communities. Beginning in 2006 we sampled riparian habitat, geomorphology, instream habitat, water chemistry, fishes, and amphibians from three channelized streams without herbaceous riparian buffers, three channelized streams with herbaceous riparian buffers, and two unchannelized streams with forested riparian zones in central Ohio. Herbaceous riparian buffers were installed between 2003 and 2005 through the Conservation Reserve Enhancement Program. Preliminary analysis of the first two years of data observed that channelized streams with herbaceous riparian buffers had greater riparian widths than channelized streams without buffers. No differences in geomorphology, instream habitat, water chemistry, fish community, and amphibian community variables occurred between buffer types. These preliminary results suggest that widening riparian buffers of channelized headwater streams

without altering riparian vegetative structure, geomorphology, or instream habitat is not likely to influence fish or amphibian communities.

0051 Roads Symposium I, Ballroom B, Saturday 10 July 2010

Daniel Smith

University of Central Florida, Orlando, FL, United States

The Effects of Roads and Habitat Fragmentation on an Assemblage of Herpetofauna: A Case Study in Central Florida

Ross Prairie is a 6,500 ha conservation area east of Ocala, FL. It has a rich assemblage of herpetofauna including the Eastern Indigo Snake, Gopher Tortoise, and Florida Gopher Frog. It is bisected by a major state highway and surrounded on three sides by county roads. Three housing developments exist along the boundaries. We performed road-kill, track, mark-recapture and telemetry studies to determine impacts of this development. Field work was conducted from 2002 to 2005. Road-kills included 573 individuals from 27 identifiable species. A total of 474 snake tracks were recorded. In most instances these correspond to the same locations identified as road-kill hotspots. A total of 1,777 herptiles were captured in right-of-way drift fence traps. Individuals of several species of snakes, frogs, and lizards were recorded crossing the road between sandhill and wet prairie habitats. Fifty gopher tortoises were captured and marked, 25 were equipped with radio-transmitters. Only three attempted crossings of the state highway were recorded. Tortoises used habitat as close as 10-20 m from the pavement. We captured 24 eastern indigo snakes over the entire study area, observed 2 others and encountered 5 road-kills. Home range of eastern indigo snakes averaged 10.3 ha. The individuals tracked used the road as a home range boundary. GIS was used in conjunction with telemetry, track, mark-recapture and roadkill data to predict habitat use and movement behavior associated with roads and adjacent development. To improve habitat connectivity and eliminate road mortality we proposed a system of culverts, bridges and fencing.

0270 Lundberg Symposium, Ballroom D, Sunday 11 July 2010

Gerald Smith¹, Nathan Carpenter¹

¹University of Michigan, Ann Arbor, Michigan, United States, ²Paleopublications, Eagle, Idaho, United States

Late Cenozoic *Ameiurus* from Pacific Drainage North America

Ameiurus catfish species diversified in at least nine isolated Miocene and Pliocene basins in NV, OR, WA, ID, and UT. Evidence of diversification consists primarily of shapes and ornamentation of pectoral spines and skull parts. *Ameiurus peregrinus* (Lundberg) evolved in the vicinity of the Oregon-Idaho Graben in SE Oregon, as the sister to *A. vespertinus* in the western Snake River Plain of SW ID. The earliest records are around 12 million years ago in the Juntura formation, OR, and the Truckee formation, NV. About 9 Ma, drainage flowing west from a ridge in SW OR was captured by a tributary flowing northeast from the same ridge into the Snake River Plain, ID, bringing *A. peregrinus* into contact with *A. vespertinus*. They coexisted and sometimes hybridized. Possibly as a consequence of the increased drainage area, the Chalk Hills Lake filled the western Snake River Plain and encroached into OR as it deposited the Chalk Hills Formation, now with two kinds of bullheads. Eventually, only *Ameiurus vespertinus* occupied the basin of Lake Idaho, the rift lake that deposited the Glens Ferry formation and flowed to the Sacramento and Klamath rivers, until cooler climates and glaciation ended the reign of western catfishes at the end of the Pliocene and the Snake River was captured by the Columbia River.

0272 Poster Session II, Exhibit Hall D, Saturday 10 July 2010

Katrina Smith, Sean Blomquist

Tennessee Technological University, Cookeville, TN, United States

Distribution of the Black Mountain Dusky Salamander on the Cumberland Plateau in Tennessee

Desmognathus walteri, Black Mountain Dusky Salamander, is a headwater stream salamander found in the Cumberland Plateau and Mountains ecoregion of Tennessee, Kentucky, Virginia, and West Virginia. Little is known about the ecology of this species and, with only 30 known occurrences in Tennessee, their distribution hasn't been well defined in Tennessee. Our research delineated their distribution in Tennessee. Based on a preliminary habitat model we randomly selected 54 first-order streams >300 meters to conduct visual encounter surveys. Currently, 17 new sites have been recorded for this species representing 16 new streams and 9 new watersheds (12-digit hydrologic units). The area representing *D. walteri* range in Tennessee increased from 442,070 ha to 721,324 ha. A new county record was documented in Rhea County representing a 7.8 mile

southern range extension. A 14.4 mile western range extension was documented within Cumberland County and a 12.5 mile southeastern range extension within Anderson County. Surveys will continue in 2010, and we will develop habitat models at the watershed and microhabitat scales based on occupancy modeling. The results of this research will be applied to two conservation planning efforts on the Cumberland Plateau, the Northern Cumberlands Forest Resources Habitat Conservation Plan (HCP) and the Water Resources HCP.

0022 Herp Systematics & Biogeography, 551 AB, Saturday 10 July 2010

Krister Smith

Senckenberg Museum, Frankfurt, Germany

The Evolution of Mid-latitude Squamate Faunas During the Paleogene: The Biogeography of a World in Climatic Transition

The climate of the middle latitudes during the Eocene was similar to that of the tropical latitudes today. A plethora of new fossil finds now illuminates the evolution of lower vertebrate faunas and the response of this component of the terrestrial biota to major climate transitions during the Paleogene. Particularly important have been localities rich in isolated material. New probabilistic techniques and detailed osteological analyses allow for the secondary association of abundant dermal cranial remains and a far more comprehensive understanding of morphology. Thus, fossil taxa may be placed robustly in an explicit phylogenetic framework. Global warming near the Paleocene-Eocene boundary resulted in the first occurrence in mid-latitude North America of diverse lineages, including iguanids, anguids, and the xantusiid *Lepidophyma*. Many of these lineages continued to diversify at mid-latitude during the Eocene. Iguanidae (=Pleurodonta) is now especially well documented. Late Eocene iguanids include relatives of the polychrotine *Polychrus* and the iguanine *Dipsosaurus* and a crown corytophanine related to *Corytophanes* and *Laemanctus*. Most of these lineages seem to have disappeared from mid-latitude North America during the global cooling of the earliest Oligocene. Thus, middle latitude Eocene squamates are not merely related in a general sense to living tropical lineages. Rather, specific presently tropical clades were radiating at middle latitudes. This fact, in combination with the biogeographic shifts apparent in the fossil record, are consistent with the notion that the present latitudinal diversity gradient reflects in part the concentration of lineages into tropical latitudes in the later Cenozoic.

0693 Fish Systematics I, Ballroom D, Monday 12 July 2010

Leo Smith¹, Edward Wiley²

¹*The Field Museum, Chicago, IL, United States*, ²*The University of Kansas, Lawrence, KS, United States*

Inter- and Intrarelationships of the Perciformes

In their recently published teleostean classification, Wiley and Johnson highlighted the familiar problem that several recognized fish assemblages such as the classical Perciformes are unsupported by synapomorphic diagnoses. They noted that the traditional classification of this assemblage “looks impressively detailed, but the emperor really has no clothes. It is time for a change.” The difficulty in making the necessary wholesale change is that a comprehensive and evidence-based alternative must be provided. In this particular example, resolving the placement of the nearly 100 families in their revised Perciformes (Moronoidei or Percoidei of previous authors) among the remainder of percomorphs is the daunting first step toward resolving the so-called percomorph problem. In this study, we will present the results of a molecular study aimed at placing all perciform families with their percomorph allies. We will focus the talk on morphological and molecular investigations into some of the novel molecular groupings.

0718 AES Ecology, 551 AB, Thursday 8 July 2010

Wade D. Smith¹, J. Fernando Márquez-Farías², Jessica A. Miller³, Selina S. Heppell¹

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Spatial and Temporal Variation in Vertebral Chemical Composition: Evaluating the Potential to Distinguish Natal Origin from Natural Elemental Markers in Elasmobranchs

Differences in the chemical composition of calcified structures are used to reconstruct environmental history and reveal natal origins, dispersal patterns, spatial dynamics, and metapopulation structure of many marine organisms. Because the use of discrete nursery areas is common among elasmobranchs, distinctive chemical markers may be incorporated into the vertebrae of individuals as they occupy these areas during the first months or years of their lives. We evaluate the assumptions of elemental analysis for the cartilaginous vertebrae of elasmobranchs and compare the variation observed in this

study with that reported for the calcified structures of teleosts and mollusks. Vertebrae were collected from young-of-the-year scalloped hammerhead sharks (*Sphyrna lewini*) from five locations along the Pacific coast of Mexico and Costa Rica in 2007 and 2008 to assess patterns of spatial and temporal variability in elemental composition. Elemental composition was measured using Laser Ablation Inductively Coupled Plasma Mass Spectrometry and the resulting elemental concentrations were expressed relative to their ratio with calcium. Elemental composition (Ba, Cd, Co, Cr, La, Li, Pb, Mg, Mn, Ni, Rb, Sr, Ti, V, Zn, Zr) did not vary between vertebrate within age-0 individuals. However, elemental composition differed significantly between the region of vertebrae that was deposited post-partum in comparison to that which developed while in-utero. Multivariate analysis of variance was applied to examine temporal (intra- and inter-annual) differences in vertebral chemistry within and among sample locations. The ability to successfully classify individual specimens to their site of natal origin was assessed through quadratic discriminant function analysis.

0725 SSAR SEIBERT CONSERVATION AWARD, 555 AB, Friday 9 July 2010

Nicole Smolensky, Lee Fitzgerald

Texas A&M University, College Station TX, United States

Population Variation in Dune-dwelling Lizards in Response to Patch Size, Patch Quality, and Oil and Gas Development

Populations do not always show immediate response to habitat loss, nor are population fluctuations correlated to habitat loss alone. Local factors such as patch size and quality, in concert with stochastic population variation across space and time can mask effects of habitat loss on populations at broader spatial scales. We studied the relationships between quality and quantity of habitat patches and land conversion to caliche roads and well pads associated with oil and gas development. We asked how these factors affected abundance of dune-dwelling lizards, with emphasis on a habitat specialist, *Sceloporus arenicolus*. Open sandy depressions in dune complexes are an important landscape feature to these lizards, thus the size and total summed area of these patches in a study site were our measures of habitat quality and quantity. There were significant differences in habitat quality among sites, and habitat quality and quantity were significantly correlated. The abundances of all lizards, including *S. arenicolus*, varied significantly among sites. This variation could be explained by habitat quantity. The relationships between oil and gas development, habitat quantity and quality, and lizard abundances likely occur on different spatial scales constraining our ability to detect direct effects of oil and gas development alone. Our work represents the first study to investigate effects of oil and gas development on a dune-dwelling lizard assemblage. Future research that includes long-term studies at broader spatial and temporal scales and Before-After-Control-Intervention experiments will greatly improve our ability to detect effects of oil and gas development on habitat and biodiversity.

0337 SSAR SEIBERT ECOLOGY AWARD, 555 AB, Thursday 8 July 2010

Sarah Snyder¹, C. Richard Tracy¹, Kenneth Nussear², Lesley DeFalco²

¹University of Nevada, Reno, Reno, NV, United States, ²US Geological Survey, Henderson, NV, United States

Quantifying the Thermal Quality of Burned and Unburned Habitat for the Desert Tortoise (*Gopherus agassizii*)

Recently, fires in the Mojave Desert have burned extensive portions of habitat used by the threatened desert tortoise (*Gopherus agassizii*). Burned landscapes may challenge the thermoregulatory opportunities of tortoises, because they rely on vegetative cover as a buffer from extremes in desert thermal environments. By reducing the availability, or altering the physical properties, of above-ground vegetative cover, fires may indirectly require behavioral and/or physiological changes by tortoises living in burned-unburned habitat interfaces. To assess differences in thermal quality with respect to preferred tortoise body temperature, we placed operative temperature models in various microhabitats available to tortoises in burned and unburned areas. We determined quantity of cover per shrub species using line transects in both habitat types. These two measurements were used to quantify the thermal environment available to a tortoise using a space-time index reported in meters squared x hours (m² x h). Although number of hours available for activity in burned and unburned areas may be similar at certain times of day, a reduction in cover in burned habitats results in fewer meters available, and thus a lower index. Results suggest that thermal opportunities may differ between burned and unburned habitat, influencing tortoise behavior, habitat use, and potential for population persistence.

0618 Fish Systematics I, Ballroom D, Monday 12 July 2010

Julie Sommer¹, Evelyn Habit², Victor Cussac³, Roberto Cifuentes², Cecilia Conte-Grand³, Guillermo Orti⁴

¹University of Nebraska, Lincoln, NE, United States, ²Universidad de Concepcion, Concepcion, Chile, ³Universidad del Comahue, Bariloche, Argentina, ⁴George Washington University, Washington, DC, United States

Phylogeny, Species Boundaries, and Marine to Freshwater Transitions in South American Silversides

A molecular phylogeny of the tribe Sorgentinini reveals significant discordance with previous hypotheses based on morphology. A total of 446 individuals representing 16 out of 23 nominal species were sampled from throughout their range in South America.

Mitochondrial cytochrome b DNA sequences were obtained for all specimens and a subsample was analyzed for the S7 nuclear marker. The molecular evidence provided strong support for the monophyly of both included genera and many of the nominal species, but failed to produce diagnostic characters to differentiate two nominal species within *Basilichthys* (*B. microlepidotus* and *B. australis*) and several species within *Odontesthes*. The latter include the Chilean freshwater species *O. mauleanum* and *O. microlepidotus*, the widespread marine taxa *O. regia* and *O. gracilis* from the Chilean Pacific coast and J. Fernandez Islands, respectively, and several freshwater and marine species from Argentina. Most notably, a clade comprising *O. bonariensis* and *O. argentinensis* and several species recently described from Southern Brazil is strongly supported by the molecular data, but shows poor resolution to differentiate the contained taxa. Although some species are strictly marine or freshwater, two clades identified by the molecular data show strong evidence of repeated historical transitions between marine and freshwater habitats. Phylogenetic reconstruction implies an ancestral marine habitat for this group, with at least five instances of freshwater invasion and some reversals to marine habitat.

0482 Fish Systematics & Morphology, Ballroom D, Friday 9 July 2010

John Sparks¹, Zachary Baldwin¹, Christopher Braun²

¹American Museum of Natural History, NY, United States, ²Hunter College/CUNY, NY, United States

Anatomical Specializations and Enhanced Auditory Ability in Malagasy-South Asian Cichlids

The Malagasy-South Asian (MSA) cichlids exhibit numerous anatomical specializations that appear to be associated with enhanced auditory ability. Taxa within this assemblage range from unspecialized (*Katria*), to moderately specialized (*Ptychochromis*, *Ptychochromoides*, and *Paratilapia*), highly specialized (*Etroplus*), and extremely specialized (*Paretroplus*). All MSA cichlids, with the exception of *Katria* and *Oxylapia*, possess enlarged exoccipital foramina and large, paired anterior extensions of the gas bladder. In *Paratilapia*, *Ptychochromis*, and *Ptychochromoides*, paired anterior diverticula of the gas bladder abut the enlarged exoccipital openings, whereas in *Etroplinae* (*Paretroplus* + *Etroplus*), the paired gas bladder diverticula penetrate the exoccipital foramina and abut the inner ear, creating a direct otophysic connection. In *Paretroplus*, the exoccipital foramina are greatly enlarged and internally comprise multiple chambers. Likewise, the paired anterior gas bladder extensions in *Paretroplus* are by far the most structurally complex, with multiple bullae separated by constrictions, extremely narrow connections to the main chamber, a tough, rigid tunica externa, and complex intracranial expansions. Gas bladder and associated anatomical specializations are examined in a phylogenetic context and with reference to audiograms generated for a number of species using ABR (AEP) methodology.

0301 Fish Behavior/Acoustics, 555 AB, Sunday 11 July 2010

Patty Speares, Carol Johnston

Auburn University, Auburn, AL, United States

The Effects of Conspecific Playbacks on Behavior and Hormone Modulation in *Etheostoma crossopterum*

Steroid hormones have been implicated in modulating many behaviors essential to survival, including those related to reproductive behavior. Social cues, such as acoustic signals, can regulate these hormones, and therefore ultimately affect these critical behaviors. Interactions between vocalizations, hormones, and behavior have been well studied in birds, amphibians and some species of fishes. There are still many questions that remain, however, regarding the effect of playback vocalizations on hormone levels in fishes. It is known that playbacks of male vocalizations can affect hormone levels in male fishes, when examined in concert with other behaviors. What effect playback vocalizations have on males independent of these behaviors and how these vocalizations affect female hormone levels has not been investigated, however. This presentation will discuss the behavioral and hormonal responses to acoustic vocalizations in the fringed darter, *Etheostoma crossopterum*. Darters are small benthic fish that adopt a reproductive strategy in which a male establishes a nest cavity and recruits multiple females to lay eggs within his shelter. These nest guarding males have been shown to be vocal and acoustic communication is thought to be critical in allowing these males to recruit females (courtship vocalizations) and also ward off other males (aggressive vocalizations). Recordings made from males in aggressive, courtship and spawning interactions will be used as playbacks for both male and female fish. Behaviors and hormonal responses of the fish in response to these playbacks will be discussed, as well as the methodology for obtaining the hormone data using water collection methods.

0773 Acoustics Symposium III, Ballroom D, Sunday 11 July 2010

Mark W. Sprague, Joseph J. Luczkovich

East Carolina University, Greenville, NC, United States

Propagation of Fish Sounds in Very Shallow Water

An understanding of sound propagation is necessary in order to interpret recordings of sounds produced by any animal. This is especially true for interpreting fish sound recordings because poor underwater light transmission limits a researcher's ability to determine the location of the sound source. The propagation distance of a fish sound depends on the source level, the background level, and the propagation losses. In very shallow environments (water depths 10 m or less), such as estuaries and shallow rivers

and lakes, sound reflections off of the bottom and the surface of the water are important factors in sound propagation and can limit the frequencies that will travel significant distances. Researchers must understand how far sounds propagate in order to establish limitations on the position of a sound source in a recording. Sound propagation properties are important to the fish producing sounds as well and may have significant influences on fish behavior. For example, it is advantageous for fish producing spawning advertisement calls to broadcast their sounds to potential mates but disadvantageous to broadcast the same sounds to potential predators. We will discuss the implications of sound propagation on the location of and distribution of individuals within aggregations of calling fishes. Sound propagation distance could be an important factor in selection of the location of spawning aggregations and the distance between individuals competing acoustically for potential mates.

0473 Karel Liem Symposium, Ballroom D, Thursday 8 July 2010

Emily Standen

McGill University, Montreal, PQ, Canada

Why was Karel Liem Excited about Pelvic Fins?

The last 'serious' question Karel asked me was at my thesis defense. It was a leading comment more than a question and in my haze of adrenalin I only vaguely remember it having to do with adaptation, natural selection, Darwin's Tripod and how pelvic fins, in their diversity of form and function, could be the absolute example explaining the roles of agency, efficacy and scope in evolutionary theory. Wow! I thought as he spoke, I'm almost done my defense. In the time after my defense I have had time to reflect back on Karel's comment. Pelvic fins in fishes are morphologically and functionally diverse. Of all fish fins, pelvic fins have been lost the most number of times and could be argued to be the most diverse in form and hypothesized function suggesting an interesting degree of genotypic and phenotypic flexibility. Guided by my own work on the locomotory function of trout pelvic fins as well as Karel's enthusiasm for the topic I will attempt to use pelvic fin morphological and functional diversity to address the concepts of agency, efficacy and scope in evolutionary theory.

0602 Poster Session I, Exhibit Hall D, Friday 9 July 2010; ASIH STORER HERPETOLOGY AWARD

Edward Stanley

Richard Gilder Graduate School, New York, New York, United States

A Phylogenetic Analysis of the *Cordylus warreni* Species Complex

The *Cordylus warreni* species complex comprises seven nominal taxa: *Cordylus warreni warreni*, *Cordylus warreni barbertonensis*, *Cordylus depressus*, *Cordylus mossambicus*, *Cordylus regius*, *Cordylus breyeri* and *Cordylus vandami*. These large, spinose girdled lizards are found in rocky outcrops throughout the mountainous regions of Northeast South Africa, Swaziland, Zimbabwe and Mozambique. Extensive variation in color pattern and scale characters is seen across this group and the status of many of the taxa is controversial. I used a molecular approach to explore the evolutionary relationships of the complex, employing dense taxon sampling and analyzing mitochondrial and nuclear DNA to produce a well-resolved phylogeny. Eight lineages were recovered with good support that corresponded closely to both phenotype and geographical distribution. All eight lineages recovered by the analysis showed significant differentiation. A deep divide was recovered between the South African and Swaziland populations of the lowveld subspecies, *Cordylus warreni barbertonensis*, with the latter clade more closely related to the subspecies from the Lebombo mountains, *Cordylus warreni warreni*. Several characters differentiate the swazi and South African forms. The distinctively smooth scaled lizards from Entabeni forest reserve were once considered to be a valid species, *Cordylus laevigatus*, but our study recovers them within *Cordylus depressus*.

0180 Fish Systematics I, Ballroom D, Monday 12 July 2010

Jay Stauffer¹, Timothy King¹

¹Penn State University, University Park, PA, United States, ²U. S. Geological Survey, Kearneysville, WV, United States

Differentiation in Southern Appalachian Brook Trout, *Salvelinus fontinalis*

Geographic constraints within Great Smoky Mountains National Park (GRSM) isolate populations of Brook Trout, *Salvelinus fontinalis*. Functionally, these geographic populations are veritable "sky islands" as there is little or no opportunity for gene flow. Demographically, these processes reduce effective population size and accelerate extinction. Tissue samples from Greenbrier, Indian Camp, and Cosby creeks were genotyped and F_{ST} values between populations ranged from 0.429 - 0.60. The minimum polygon clusters formed when plotting the sheared second principal components of the morphometric data against the first principal components of the meristic data for populations from each creek were significantly different ($p < 0.05$). Thus, genetic and

morphometric analyses allowed discrimination among the source populations. GRSM fishery managers reestablished *S. fontinalis* in LeConte Creek of the Pigeon-French Broad river system in 1999 using fish from the above streams. Seven years post translocation, we collected, genotyped, and compared fish from LeConte Creek, using parentage assignment testing. We determined at least 77% of the fish sampled resulted from parents originating from the same source stream (i.e., three discernable populations of *S. fontinalis* co-exist in LeConte Creek). Thus, among the introduced populations there is positive (selective) assortative mating and/or some form of post-reproductive isolating mechanism; thus these populations may in fact be species *sensu* the biological species concept.

0249 Fish Systematics II, Ballroom D, Monday 12 July 2010

Jay Stauffer¹, Adrianus Konings², Rachel Cleaver Yoder¹

¹*Penn State University, University Park, PA, United States*, ²*Cichlid Press, El Paso, Texas, United States*

Two New Cichlids in the Genus *Stigmatochromis* from Lake Malawi, Africa

Two new cichlids from Lake Malawi, Africa are described. Morphometric and meristic data were collected for the two new species and all other species in the genus. Principle component analysis was used to create minimum polygon clusters to determine differences among groups. *Stigmatochromis* n. sp. "guttatus" was distinguishable from all other species in the genus. *Stigmatochromis* n. sp. "tolae" is visually very similar to *Stigmatochromis woodi*, however, breeding habitat preference differs between the two. *Stigmatochromis* n. sp. "tolae" was distinguished from all other species in the genus.

0031 Herp Physiology, 556 AB, Monday 12 July 2010

John Steffen, Arthur Appel

Auburn University, Auburn, AL, United States

The Energetic Costs of Social Displays in Male Brown Anoles

Male anoline social displays are dynamic and typically consist of several different components (e.g., head nods, dewlap extension, and two and four legged push-ups), which appear to be physically costly. Studying the energetics of these different display components may allow us to define the limits of sexual selection by designating which display components are significantly energetically expensive, and which may then act as a form of fitness cost. To investigate the energetic expense of these display components, we quantified oxygen consumption (VO₂) of displaying male brown anoles. We placed focal adult males in transparent respirometry chambers that were 5 cm away from a

size-matched male and a female (both in separate, transparent plastic boxes). We performed Flow-through respirometry on the focal male to determine male oxygen consumption while engaged in social displays. We used an event recorder program to count the number and duration of all display components, and we obtained oxygen consumption values for each display component that occurred. Multiple regression of display VO₂ against real-time sums of the display component O₂ consumption rates revealed that push up and head nod frequency were the only components to explain a significant variation in display VO₂. These results imply that components of display behavior such as dewlap extensions and head nods are relatively energetically inexpensive, whereas 2 and 4-legged push-ups are more costly. These findings may have implications for understanding which components of the anoline display are under significant sexual selection.

**0019 SSAR SEIBERT SYSTEMATICS & EVOLUTION/SSAR SEIBERT
PHYSIOLOGY, 555 AB, Friday 9 July 2010**

Michael Steffen, Ronald Bonett

University of Tulsa, Tulsa, OK, United States

Phylogeography of an Endemic Ouachita Mountain Salamander (*Eurycea multiplicata*)

The Ouachita Mountains of Oklahoma and Arkansas are home to many endemic species, including several plants, crayfish, fishes, and salamanders. Recent studies have shown high levels of genetic diversity within endemic Ouachita salamanders, indicating a long history of population fragmentation and divergence. One such species, the Many Ribbed Salamander (*Eurycea multiplicata*) contains four highly divergent mitochondrial lineages across the Ouachitas. Using phylogenetic analyses based on mitochondrial and nuclear DNA we present patterns of lineage divergence and diversification with *E. multiplicata* and compare them to other Ouachita taxa to provide insight as to what historical factors have shaped the biodiversity of this region.

0669 SSAR SEIBERT ECOLOGY AWARD, 555 AB, Thursday 8 July 2010

Anne Stengle¹, Thomas Tynning²

¹University of Massachusetts, Amherst, MA, United States, ²Berkshire Community College, Pittsfield, MA, United States

Body Temperature Range of Black Ratsnakes (*Pantherophis alleghaniensis*) Occupying Forest and Roadside Habitats

Use of forest openings may be critical to body temperature regulation of black ratsnakes, especially at the northern edge of their geographic range, and innovations in technology have provided new opportunities to examine their thermal ecology. Beginning in June of 2008, we monitored the habitat use and body temperature of eight black ratsnakes at the edge of their range in Massachusetts using implanted radio transmitters and internal temperature data loggers. Our study site included forested habitat surrounded by state highways, residential areas, and a college campus, and contained at least four hibernacula. Three of these snakes during the month of August used edge habitat along roadsides, while the other five utilized forest habitat. During the month of August, roadside snakes had both higher mean daily body temperatures ($23.4 \pm 0.5^\circ\text{C}$) and a narrower range of daily body temperatures ($5.42 \pm 0.3^\circ\text{C}$) than those using forest habitats (21.9 ± 0.5 and 7.0 ± 0.4 °C respectively). Our results suggest that there is a thermoregulatory benefit for snakes using forest openings associated with roadways, though there may be other benefits. No road mortality of snakes was observed during our study, but this is a potential risk associated with use of road edges. These variations in thermal ecology have conservation implications for populations at the edge of their geographic range.

0466 Poster Session I, Exhibit Hall D, Friday 9 July 2010

Ashley Stoehr¹, Cheryl Wilga¹, Rebecca Allen²

¹University of Rhode Island, Kingston, RI, United States, ²Ross University, Roseau, Dominica

Prey Processing in Elasmobranchs

Prey processing is an integral part of the feeding process, however, there are relatively few studies that focus on post-capture behavior in fishes. Arch morphology is related to prey capture mode in elasmobranchs, but the relationship is little understood for prey processing. The effects of jaw, hyoid and branchial arch morphology on prey processing were studied in white-spotted bamboo sharks (*Chiloscyllium plagiosum*), spiny dogfish (*Squalus acanthias*), and little skates (*Leucoraja erinacea*), which possess short lateral, medium lateral, and anterior hyomandibular orientations, respectively. The kinematics

of the jaws, hyoid, and 2nd branchial arches (posteriorly or laterally oriented), and associated pressures were quantified during suction and bite processing. In all species gape, hyoid, and pharyngeal expansion generated subambient pressures, while gape, hyoid, and pharyngeal compression created superambient pressures. The hyoid and pharyngeal arches move in synchrony during suction and bite processing in skates and dogfish, but not in bamboo sharks. The directional movement of the arches during processing appears to depend on the morphological orientation and skeletal coupling to other structures. Bite events are longer in duration than suction events. Skates had the longest durations for all events. The bamboo sharks created the greatest suction pressures, while pressures were more similar for bite events. The bamboo sharks, which are specialist predators, are more stereotyped in their mechanisms compared to the dogfish and skates, which are generalist predators. These differences during prey processing reflects different degrees of cranial kinesis and morphological constraint among the species.

0708 Poster Session I, Exhibit Hall D, Friday 9 July 2010; AES CARRIER AWARD

Kristine Stump¹, Diego Cardenosa², Gaby de Tezanos², Samuel Gruber³

¹University of Miami - Rosenstiel School of Marine and Atmospheric Science, Miami, FL, United States, ²Universidad de Los Andes, Bogota, Colombia, ³Bimini Biological Field Station, Bimini, Bahamas

Assessing Juvenile Lemon Shark Mortality over Time Using a Long-term Mark-Recapture Dataset

In Bimini, Bahamas, a juvenile lemon shark (*Negaprion brevirostris*) nursery in a Marine Protected Area (MPA) recently created by the Government of the Bahamas faces the threat of extensive habitat loss due to a large-scale coastal development project adjacent to the MPA. Within the threatened North Sound nursery, juvenile *N. brevirostris* remain site-attached for a period of several years before expanding their home ranges to include a secondary nursery over a wider area. Due to the wealth of existing knowledge about this system in a relatively undisturbed state, effects of an anthropogenic impact on *N. brevirostris* can be quantified. A long-term tagging program dataset that exists for the juvenile *N. brevirostris* population allows for a comparative analysis of mortality estimates between the years before and after the onset of various degrees of nursery habitat degradation. Early mark-depletion experiments in the undisturbed nursery found a range of annual first-year survivorship between 38% and 65% which was negatively correlated with initial abundance and consistent with density-dependent survival. Following a major dredging campaign in 2001 associated with the development of Bimini Bay Resort and Marina, analyses of first-year survival in the North Sound detected a decrease of 23.5%. Here, mortality estimates since 2001 are calculated and compared to previous years to elucidate any changes correlated with

major development activities within the North Sound nursery, including extensive mangrove removal in 2005.

0137 SSAR SEIBERT ECOLOGY AWARD, 555 AB, Thursday 8 July 2010

Jennifer Stynoski¹, Virginia Noble², Meredith Strider³

¹University of Miami, Coral Gables, FL, United States, ²Organization for Tropical Studies, Heredia Province, Costa Rica, ³University of Maryland, College Park, MD, United States

To Eat but Not to Be Eaten: Honest Begging Signals and Visual Detection of Predators and Mothers by Tadpoles of the Strawberry Poison Frog (*Oophaga pumilio*)

Theory suggests that offspring solicitation behavior (or “begging”) is a costly signal that indicates need to parents who subsequently provision the appropriate amount of food. Empirical work in birds, mammals, and invertebrates supports this theory, but studies have been complicated by factors such as sibling competition and indirect measurements of provisioning and fitness. Phytotelm-dwelling tadpoles of the Strawberry Poison Frog (*Oophaga pumilio*) display begging behavior by stiffening their tail and vibrating against the visiting mother to stimulate nutritive egg laying. We studied aspects of this behavior using free-living animals in Costa Rica. We videotaped tadpoles in the lab with various stimuli and determined the proportion of time tadpoles rested, swam, or vibrated. Tadpoles did not use chemosensory cues to detect the presence of adult *O. pumilio*, but were more active when given visual cues and vibrated only when given tactile cues. Begging was much more intense at conspecific adults than at other species of bromeliad-dwelling frogs. Tadpoles swam less in the presence of a predatory spider, suggesting that begging activity is costly. Fast-growing tadpoles in the middle stages of development begged more intensely than those in early or late development. Lastly, tadpoles starved for various lengths of time begged intensely, but those fed the same day did not beg. Together, this work suggests that these individually-reared and diurnal tadpoles use visual signals both to honestly signal their need to mothers and to avoid predation. Ongoing work is also exploring the effects of begging on maternal resource allocation and tadpole growth.

0782 AES Behavior & Ecology, 552 AB, Friday 9 July 2010

James Sulikowski¹, Ben Galuardi², Walter Buble², William Driggers⁴, Eric Hoffmayer³, Angela Cicia¹, Paul Tsang²

¹University of New England, Biddeford, ME, United States, ²University of New Hampshire, Durham, NH, United States, ³Gulf Coast Research Laboratory, Ocean Springs, MS, United States, ⁴National Marine Fisheries Service, Pascagoula, MS, United States

Dismissing Dogma? What Do We Really Know About the Spiny Dogfish, *Squalus acanthias*, Population in the U.S. Portion of the Western North Atlantic Ocean

The status of the spiny dogfish, *Squalus acanthias*, stock in the U.S. portion of the northwest Atlantic has become a contentious issue. Distributed from Maine to Florida, this species was once considered to be the most abundant shark throughout its U.S. range. As a result of reported declines below biomass threshold levels, in early 2000 the Mid-Atlantic, New England Fishery Management Councils, and Atlantic States Marine Fisheries Commission implemented a management plan which imposed annual quotas and possession limits for vessels fishing in both federal and state waters. Due to such characteristics as slow growth, extended gestation period, small litter size, and a spawning stock biomass (SSB) below threshold levels as recent as 2005, the spiny dogfish population was not anticipated to rebound for more than a decade. However, recent Northeast Fishery Science Center (NEFSC) survey data suggest a four-fold increase in SSB has occurred between 2005-2009. Based on the aforementioned life history characteristics, this substantial increase in biomass is considered biologically unrealistic. We present preliminary data to support hypotheses that are divergent to common paradigms: 1) we hypothesize that the biological unrealistic increases in SSB may be due, in part, to a substantially more active vertical movement pattern that prevents this species from being effectively captured by NEFSC otter trawl surveys; and 2) we hypothesize that the gestation period of spiny dogfish may be less than the proposed 22 months and that there may also be regionally different reproductive cycles across this species U.S range.

0716 Lundberg Symposium, Ballroom D, Sunday 11 July 2010

John P. Sullivan

Cornell University Museum of Vertebrates, Ithaca, NY, United States

John Lundberg, Ichthyological Ambassador, Molecular Phylogeneticist, and an Expanded Molecular Phylogenetic Hypothesis for the “Big Africa” Catfish Clade

Through his students and collaborators, the influence of John Lundberg’s approach to scientific discovery, phylogenetics, and his role in fostering systematic ichthyology in developing countries, extends far and wide. I describe how John Lundberg’s characteristic insights enhance our recent and ongoing molecular phylogenetic studies of siluriforms and how his example informs the work I am currently undertaking in a Fulbright Scholarship to the Democratic Republic of the Congo. As a fruit of recent African fieldwork, I present an updated and expanded molecular phylogeny for more than 50 siluroid taxa identified in our earlier work as the “Big Africa” clade that includes the families Amphiliidae, Malapteruridae, Mochokidae, Claroteidae, Lacantuniidae, Auchenoglanididae and Schilbidae.

0178 Karel Liem Symposium, Ballroom D, Thursday 8 July 2010

Adam Summers

FHL, University of Washington, Friday Harbor, WA, United States

Karel Liem and the Importance of Intuition and Controversy in the Advancement of Biology

Karel Liem possessed many fine qualities that made him both an outstanding mentor and a respected scientist, but perhaps no talent was so important or difficult to quantify as his intuition about function. This ability to home in on significant questions was paired with an instinct for developing an argument in such a way that it inspired others to probe more deeply.

0508 Poster Session III, Exhibit Hall D, Sunday 11 July 2010

Tracey Sutton¹, April Cook¹, John Galbraith², Michael Vecchione³

¹Virginia Institute of Marine Science, The College of William & Mary, Gloucester Point, VA, United States, ²NOAA Fisheries Northeast Fisheries Science Center, Woods Hole, MA, United States, ³NOAA Fisheries National Systematics Lab, Washington, DC, United States

Deep-Sea Fishes of the Mid-Atlantic Ridge: Results of the 2009 Henry Bigelow Expedition

As part of an ongoing study of the northern Mid-Atlantic Ridge biodiversity and ecology (CoML field project MAR-ECO), a detailed survey of the pelagic and demersal fishes in the region of the Charlie-Gibbs Fracture Zone (~ 600 n.m. south of Greenland) was conducted. A total of 17181 pelagic fishes (92 spp., 35 families) were sampled from 0-3000+ m, with the Myctophidae the most species-rich. The bristlemouth *Cyclothone microdon* was by far the dominant species in numbers (82% of total), while the sawtooth eel *Serrivomer beani* dominated biomass (27%). A total of 441 deep-demersal fishes (28 spp., 13 families) were sampled from 1872-3527 m, with the Macrouridae and Alepocephalidae comprising half of species numbers. The abyssal halosaur *Halosauropsis macrochir* was most abundant, while the abyssal grenadier *Coryphaenoides armatus* contributed the most biomass. Remarkable among the pelagic fish data were routine shallow catches of bathypelagic fishes (see A.B. Cook et al., this volume), and among the demersal fishes were the large size of the individuals, above or near the maximum known for many species. The high species number relative to sample number portends the enhanced deep-sea biodiversity about abrupt topographic features, while the lack of asymptote of species number versus sampling effort underscores our incomplete inventory of this biodiversity.

0579 Fish Ecology, Morphology & Physiology, 556 AB, Saturday 10 July 2010

Christopher Sweetman, Tracey Sutton

Virginia Institute of Marine Science, Gloucester Point, Virginia, United States

Distribution and Trophic Ecology of *Bathylagus euryops* (Teleostei: Microstomatidae) along the Northern Mid-Atlantic Ridge

The assemblage structure and ecology of meso- and bathypelagic fishes are poorly known in general, particularly over mid-ocean ridges. In June 2004, the month-long MAR-ECO (Census of Marine Life) research expedition aboard the R/V G.O. Sars sampled the deep-pelagic fauna over the northern Mid-Atlantic Ridge with the objective of quantitatively assessing the nekton associated with the ridge from Iceland to the

Azores. A total of 115 discrete-depth trawl samples were taken from the surface to depths of 3000+ meters using two different double-warp midwater trawls, one of commercial fishing size (a large 'Akra' trawl) and one of oceanographic research size ('Macroplankton' or 'Krill' trawl). Catch data revealed the deep-sea smelt *Bathylagus euryops* to be the biomass dominant species, accounting for over 28% of total biomass, as well as being the 3rd most abundant species along the MAR. Further distributional analyses elucidated a trend in decreasing biomass from north to south with a biomass maximum around 1500-2000 meters. Understanding the food-web structure and organic cycling of deep-pelagic ecosystems is critical for increasing our knowledge of the distributional patterns of deep-sea fishes. Preliminary results indicate that gelatinous zooplankton represents a significant component of the diet of *B. euryops*. Molecular probes are currently being developed to identify these prey items in this, and other fishes that consume gelatinous zooplankton.

0098 Poster Session III, Exhibit Hall D, Sunday 11 July 2010

Lindsey Noele Swierk, Tracy Langkilde

Penn State University, University Park, PA, United States

Finding a Perfect Match: Female Choice on Male Traits in Eastern Fence Lizards, *Sceloporus undulatus*

What makes a desirable mate? Understanding how animals select their mates can offer insight into which traits confer fitness benefits. However, reliably determining if female selection on male traits exists can be challenging. Especially in reptiles, female choice can be confounded by female selection of quality territory, or by the result of male contests. We designed an experiment using eastern fence lizards (*Sceloporus undulatus*) to uncover if females select their partners based on specific traits. We conducted 68 female choice trials in which one female lizard was presented with two males possessing identical territories. We quantified the time females spent associating with both males. Although females preferred to associate with the larger male in their arena, if females were presented with males of identical size they nevertheless exhibited a clear preference for one male over the other. This suggests that additional male traits, such as genetic makeup, may be important in female choice. Future research is planned to examine factors that influence mate choice and mechanisms by which individuals may compensate for pairing with a suboptimal mate, using both fence lizards and wood frogs, *Rana sylvatica*, as model systems.

0631 Herp Conservation III, Ballroom B, Sunday 11 July 2010

Brooke L. Talley¹, Karen R. Lips²

¹*Southern Illinois University, Carbondale, IL, United States*, ²*University of Maryland, College Park, MD, United States*

Patterns Prevalence and Intensity of Infection of *Batrachochytrium dendrobatidis* across Illinois

We surveyed Illinois anurans from 22 locations, composed of 99 wetlands, over 2 breeding seasons in 2008 and 2009. We quantified the prevalence and intensity of infection by *Batrachochytrium dendrobatidis* (*Bd*) in populations representing a wide range of species, latitudes, and habitats. We swabbed over 5,000 individuals of 11 species, including 7 widespread species to compare infection among latitudes and habitats independent of species identity. In 2008 *Bd* was present in the central (54% prevalence) and northern (27% prevalence) wetlands, but absent from the southern site. Anurans at all 12 wetlands sampled in 2008 were *Bd* positive; prevalence ranged from 46-64% in 3 central Illinois wetlands, and 8-60% in 5 northern Illinois wetlands. All 7 widespread species were infected; prevalence ranged from 30 - 60% among species. *Bd* infection intensity varied between sites; in northern Illinois the average infection was 940 zoospore equivalents (N = 96; range: 1-20,852), and in central Illinois it was 3,095 (N = 51; range: 2-57,020). Species varied in intensity of infection, *Acris crepitans* had the highest levels at both sites (45,872 and 20,852 zoospores), while *Hyla chrysoscelis* also had high levels (57,020) at the northern site. The highest infections were concentrated at one wetland at each site. Results are consistent with reports of population declines of *Acris crepitans* in northern Illinois. Our estimates of prevalence and intensity are higher than most reported for the US amphibians and emphasize the need for large scale, systematic surveys to understand enzootic disease dynamics.

0646 Fish Systematics I, Ballroom D, Monday 12 July 2010

Kevin Tang¹, Henry Bart², Andrew Simons³, Robert Wood¹, Wei-Jen Chen⁴, Micheal Dosey², Mary Agnew¹, M. Vincent Hirt³, Lei Yang¹, Richard Mayden¹

¹*Saint Louis University, St. Louis, MO, United States*, ²*Tulane University, New Orleans, LA, United States*, ³*University of Minnesota, Minneapolis-St. Paul, Minnesota, United States*, ⁴*National Taiwan University, Taipei, Taiwan*

Phylogenetic Relationships of the Cyprinid Subfamily Gobioninae (Teleostei: Cypriniformes)

The subfamily Gobioninae is a diverse group of cyprinid fishes, distributed across Eurasia. Previous studies have supported the monophyly of the subfamily based on

both morphological and molecular characters, but relationships within the Gobioninae are far from resolved. For this study, sequence data from more than 140 taxa, representing over 80 gobionine taxa in 30 different genera, were sequenced. Representative species were drawn from available cyprinid and cypriniform diversity, with outgroup taxa ranging from other cyprinid subfamilies to more distantly related ostariophysan groups. Our analyses were based on sequences from two mitochondrial loci (COI, cyt b) and two nuclear loci (RAG1, rhodopsin), which were then evaluated using parsimony, maximum likelihood, and Bayesian methods. Our results find strong support for the monophyly of Gobioninae as well as lineages within the subfamily. These relationships within the Gobioninae as well as its relationships to other cyprinid subfamilies will be discussed.

0591 Poster Session I, Exhibit Hall D, Friday 9 July 2010

Chantel Taylor, Nicholas Gidmark, Elizabeth Brainerd

Brown University, Providence, RI, United States

Anatomy and Function of the Pharyngeal Jaw in a Durophagous Cyprinid Fish

Cyprinids have lost all bony elements of the fifth gill arch except ceratobranchials. Teeth ankylos to the hypertrophied ceratobranchials, forming laterally paired, lower pharyngeal jaws. Upper pharyngeal jaws are absent; the upper biting surface consists of a pedestal of bone, projecting ventrally from the basioccipital bone and covered with a horny pad. Though rigorous histology has not been published on this pad, it is less stiff than either bone or tooth enamel. The function of this pad is unclear - most vertebrates process food with tooth-on-tooth contact. We used an in-vivo skeletal imaging technique -X-ray Reconstruction of Moving Morphology, or XROMM - to determine 3D bone positions during biting in a molluscivorous cyprinid, *Mylopharyngodon piceus*, the black carp. XROMM allows calculation of 3D moment arms of the two large jaw closing muscles that pull the jaw against the basioccipital pad. The orientations of these muscles are nearly 90 degrees different, and muscular forces exceed 230 Newtons per side. The large angle between retractors may aid in creating more stability at large gapes. By combining bone positions, material properties data and 3D force modeling, we develop a framework for studies of muscle physiology, functional anatomy, and durophagy in this species. Specifically, we demonstrate the importance of the ligament connecting right and left lower pharyngeal jaws in counteracting 3D torques from the adductor muscles. We have also found that the retractor os pharyngeus superioris - a smaller jaw retractor - is subdivided, a common evolutionary trend in high-force producing fishes.

0742 Headstarting Turtle Symposium II, Ballroom B, Monday 12 July 2010

David Taylor

Commonwealth of Massachusetts Division of Fisheries and Wildlife, Westboro, MA, United States

The Use of Simple Protocol to Standardize the Efforts of Cooperators Headstarting the Northern Red-bellied Cooter

Since 1985, headstarting has been used as a tool in the conservation of the federally Endangered Massachusetts population of Northern Red-bellied Cooter (*Pseudemys rubriventris*). A simple headstarting protocol was followed by about 20 cooperating organizations and individuals each year. Some of these groups (e.g. zoos and aquariums) had full-time animal care staff while other turtles were raised by schools or individuals. The protocol provided easy to follow guidelines for appropriate diet, water temperature, water quality and lighting/basking. Hatchlings were kept for 9 months (September - May). Growth was most affected by water temperature (optimal was 86°F/30°C), and proper diet. Cooperators were required to submit data on average weights and carapace lengths once a month. These data provided an opportunity to detect facilities that were not following the protocol and individual turtles that were not doing well. Slow growth was the most frequently encountered problem which was related to lower than recommended water temperatures and/or improper diet. Failures to follow the protocols led to cases of abnormalities in shell shape and soft shells with poor bone growth. Survival to release was 94% and did not significantly differ between large institutions and schools/individuals.

0371 Fish Ecology, Morphology & Physiology, 556 AB, Saturday 10 July 2010

David Taylor, Joseph Szczebak

Roger Williams University, Bristol, RI, United States

Ontogenetic Patterns in Bluefish *Pomatomus saltatrix* Feeding Ecology and the Effect on Mercury Biomagnification

The bluefish *Pomatomus saltatrix* is an apex predator common to temperate and semi-tropical waters worldwide. Owing to their high trophic level status, bluefish may have elevated concentrations of biomagnifying contaminants, including mercury (Hg). In this study, we examined the biomagnification and trophic transfer of Hg in bluefish across multiple life history stages (early juveniles to adults; age-0 to age-7). Bluefish were collected from the Narragansett Bay (RI, USA), and white muscle tissue was analyzed for total Hg. Results were evaluated relative to bluefish age, body size, and Hg content of preferred prey. Dietary and nitrogen stable isotope ($\delta^{15}\text{N}$) analysis was also used to

elucidate the effect of trophic processes on bluefish Hg concentrations. The Hg content of bluefish muscle tissue was positively correlated with age and length, although age-0 juveniles accumulated Hg faster than older conspecifics (age-1+). Accelerated Hg biomagnification in age-0 bluefish is likely due to these individuals occupying a comparable trophic level to age-1+ bluefish (3.5 and 3.6, respectively), as well as age-0 bluefish having greater standardized consumption rates of Hg-enriched prey. The positive correlation observed between mean biota Hg content and $\delta^{15}\text{N}$ signatures further indicates that Hg is trophically transferred through the estuarine food web, and higher trophic level organisms (i.e., bluefish with enriched $\delta^{15}\text{N}$) have increased Hg concentrations. Concluding, results from this study suggest that: (1) early life history is critical to the cumulative Hg burden in bluefish, and (2) dietary preference and trophic structure are important factors affecting Hg biomagnification in bluefish.

0108 Herp Physiology, 556 AB, Monday 12 July 2010

Emily Taylor, Benjamin Capper, Jessica Felix, Anthony Lumbad, Nicholas Pollock, Kelsey Tallon

California Polytechnic State University, San Luis Obispo, CA, United States

Effects of Testosterone on the Bactericidal Properties of Lizard Blood

Testosterone is immunosuppressive in many animal species, resulting in sex and seasonal differences in immune function. In lizards, testosterone lowers lymphocyte count, inhibits T cell-mediated immunity, and results in increased parasite loads. We tested the hypothesis that testosterone inhibits complement-mediated killing of bacteria in Western fence lizards (*Sceloporus occidentalis*). Lizards were collected in summer when testosterone is low, surgically implanted with either testosterone-filled or blank (control) implants, and maintained in the laboratory. We collected plasma from the lizards and incubated it overnight with *E. coli*. Compared to the negative control, plasma from both testosterone-treated and control males exhibited strong bactericidal properties. However, plasma from testosterone-treated males killed more bacteria than that of control males. This led us to reject our hypothesis because testosterone actually improves complement-mediated killing of bacteria. We are repeating the experiment this spring using free-ranging males instead of captive males. Regulation of the bactericidal properties of blood by sex hormones and other factors may be important in the community ecology of infectious bacteria. In California, *S. occidentalis* are major hosts for ticks that are vectors for the spirochete *Borellia burgdorferi*, which causes Lyme disease in humans. *Sceloporus occidentalis* are incompetent hosts for *Borellia*, meaning that their bactericidal proteins kill the spirochete in nymphal ticks, thereby preventing the ticks from passing on the bacterium to mammals as adults. Further studies will examine effects of sex hormones and immune function on the borreliacidal properties of host blood in the context of the community ecology of Lyme disease.

0570 AES GRUBER AWARD, 551 AB, Friday 9 July 2010

Mae Taylor, Harold Laubach, David Kerstetter

Nova Southeastern University, Dania Beach, FL, United States

Spiral Valve Parasites of Selected Tropical Pelagic Elasmobranchs from the Western North Atlantic Ocean

Concerns regarding population status of many elasmobranchs have prompted investigations into less obvious sources of declines, such as morbidity due to parasites. Endoparasite (internal) loads in the elasmobranch spiral valve may be a source of such unaccounted mortality and morbidity by both inhibiting nutrient uptake and stimulating inflammatory responses within the gastrointestinal tract in the host. Spiral valves of the night shark (*Carcharhinus signatus*, n=16), silky shark (*Carcharias falciformis*, n=18) and pelagic stingray (*Pteroplatytrygon violacea*, n=99) were obtained opportunistically from pelagic longline operations. Each species had varying rates of parasitization: pelagic stingray 29%, silky shark 77%, and night shark 92%. Total spiral valve parasite loads were compared against the total length, weight and sex of the host; however, no relationship was observed between these factors. A total of 133 elasmobranch hosts were examined, yielding over 800 individual parasites. The majority of parasites were cestodes (92% pelagic stingray, 93% silky, 99% night), although trematodes (5% pelagic stingray, 2% silky, 1% night), nematodes (1% silky), and acanthocephalans (3% pelagic stingray and 4% silky) were also represented throughout the samples. There are over ten families of cestodes represented throughout the samples, two families of trematodes, one family of nematode and two families of acanthocephalans. Site specification was not examined for this research. Parasites were not shown to be host specific. These results establish baseline values for expected spiral valve parasite load and species compositions for pelagic shark and stingray hosts.

0413 Fish Ecology, Morphology & Physiology, 556 AB, Saturday 10 July 2010

Mollie Taylor¹, J. Kevin Craig¹, Jennifer Wanat¹

¹Florida State University, Tallahassee, FL, United States, ²Apalachicola National Estuarine Research Reserve, Apalachicola, FL, United States

The Foraging Ecology of Juvenile Spot, *Leiostomus xanthurus*, in Apalachicola Bay, Florida

Estuaries provide important nursery habitats that support the production of ecologically and economically important fishes. Apalachicola Bay experiences considerable variation in hydrography due largely to variation in river flow that may impose constraints on the functioning of juvenile nursery habitats. Using juvenile spot, a common estuarine-

dependent species, as a model species I am testing the hypothesis that variability in diet of juvenile spot within primary nursery habitats is related to seasonal variation in river flow and associated environmental conditions. The diets of 86 juvenile spot (9 - 112 mm standard length) from 12 locations throughout Apalachicola Bay sampled monthly from February to April 2009 were included in this analysis. Individual stomach and intestine contents were identified to the lowest taxonomic level possible, counted, and a volumetric measurement was estimated for each prey category. The relative importance and percent frequency of occurrence of individual prey items was then calculated. Prey items of juvenile spot included harpacticoid and calanoid copepods, ostracods, small bivalves, nematodes, gammarid amphipods, and polychaetes. The frequency of occurrence and index of relative importance were compared between sites in Apalachicola Bay and among monthly sample collections. Continued diet and future stable isotope analyses over two years will contribute to a better understanding of the effects of variable freshwater input on the foraging ecology of juvenile spot during their residency in estuarine nursery habitats.

0074 Poster Session III, Exhibit Hall D, Sunday 11 July 2010

Amber Teare, David Rostal

Georgia Southern University, Statesboro, GA, United States

Reproductive Biology of the Alligator Snapping Turtle (*Macrochelys temminckii*)

Reproduction in ectotherms is heavily influenced by abiotic factors. Chelonian reproduction is particularly affected by temperature and photoperiod. The physiological changes associated with reproduction are understood for many sea turtle, tortoise and freshwater species (Ernst and Lovich 2009). Temperate turtles experience similar environmental conditions, resulting in similar seasonality in timing of mating, gamete production and hormone cycles. However, knowledge of reproductive cycles chiefly pertains to species that bask. The alligator snapping turtle (*Macrochelys temminckii*) is unique among temperate freshwater turtles in that it is nocturnally active and does not bask, and thus may be less influenced by changes in photoperiod (Jensen and Birkhead 2003). By studying *M. temminckii*, we can separate the effects of water temperature and photoperiod on chelonian reproduction. We hypothesized that water temperature is the more prominent cue for reproduction in turtles and predict that alligator snapping turtles will exhibit a hormone cycle similar to other temperate species. In this study, a Georgia population of *M. temminckii* was investigated to delineate their reproductive hormone cycles and gonadal development. Testosterone and estradiol were analyzed by ELISA. Females were examined by ultrasound to determine follicular development and egg production. Preliminary results indicate that mating occurs in spring and nesting occurs in late spring/early summer. Hormone analyses show that males exhibit a postnuptial peak in testosterone during the fall, while females exhibit a biphasic cycle, with testosterone peaking in spring and fall. These

findings show that *M. temminckii* display hormonal cycles and reproductive seasonality similar to other temperate turtles.

0129 Poster Session III, Exhibit Hall D, Sunday 11 July 2010

Javier Tellechea¹, Walter Norbis¹, Daniela Olsson¹, Michael Fine¹

¹University of Puerto Rico, San Juan, Puerto Rico, ²Universidad de la Republica, Montevideo, Uruguay, ³Virginia Commonwealth University, Richmond, VA, United States

Calls of the Black Drum (*Pogonias cromis*: Sciaenidae): Geographical Differences in Sound Production Between Northern and Southern Hemisphere Populations

The black drum *Pogonias cromis* appears to have a bipolar distribution being present in temperature latitudes in the Northern and Southern hemispheres. It is an estuarine-dependent demersal coastal species distributed along the Western Atlantic Ocean from Massachusetts, United States, to Rio de la Plata estuary Montevideo, Uruguay. However, its occurrence is not known from equatorial waters. Likely reproductive isolation between the two populations suggests the hypothesis of differentiation of their vocal repertoires. We quantified call development and sexual differences, not previously examined in this species. Unlike most sciaenids, both sexes possess robust sonic muscles, and both produce a disturbance call when handled. However, only males produce an advertisement call used in courtship. The disturbance call consists of a variable train of short-duration pulses (average 23 ms). The duration, interpulse interval and dominant frequency of pulses are similar in males and females and change developmentally: pulse duration and interpulse interval increase and dominant frequency decreases with fish size. Advertisement calls, recorded in the field and in captivity, are long-duration (average 184 ms) and tonal. Based on variation in fundamental frequency, which decreases with fish size, field choruses are composed of different-sized individuals. The duration of advertisement calls, about a third of those from Florida populations, suggests genetic differentiation between northern and southern populations.

0111 Poster Session II, Exhibit Hall D, Saturday 10 July 2010; NIA BEST STUDENT POSTER AWARD

Fabricio Teresa, Lilian Casatti

Universidade Estadual Paulista - UNESP, Sao Jose do Rio Preto, Brazil

Mesohabitat Fish Preferences and its Consistency across Spatial Scales in Neotropical Lowland Streams

Factors structuring communities vary across different spatial scales, but the responses to some variables can be strong enough to persist over spatial scales. Here we investigated whether hydrological features are meaningful factors structuring fish communities by evaluating their relationship with the proportion of functional groups in different spatial scales. Hydrological measurements (width, depth and flow) and fish were sampled in 62 five meters segments in three streams located in Southeastern Brazil. Hydrological measurements were combined in a cluster analysis to define the mesohabitats. Fish abundance and frequency in the mesohabitats were used to define guilds (riffle and pool species) by using the Indicator Species Analysis. Six and nine species showed preference to riffle and pool, respectively. In order to evaluate the consistency of mesohabitat scale patterns in reach scale we used data from 32 sites at the scale of stream reaches and analyzed how fish guild proportions were related to reach hydraulics (%POOL = proportion of pools vs. riffles). No correlation was found between proportion of pool species and %POOL (Spearman Correlation, $p > 0.22$), whereas a negative correlation between proportion of riffle species and %POOL was observed ($R = -0.42$, $p = 0.02$). These results indicate that mesohabitat preferences were partially consistent with the analysis made at the reach scale. Hydrological features in riffles are probably the most important concerns to riffle-dwelling individuals in streams. Presumably, siltation and habitat simplification, which are common impacts in Brazilian freshwater ecosystems, can reduce riffles distribution and contribute to decline of riffle-dwelling species.

0358 NIA I, 556 AB, Saturday 10 July 2010; NIA BEST STUDENT PAPER AWARD

Andrea Tonolli Thomaz¹, Luiz Roberto Malabarba¹, Sandro Luis Bonatto²

¹*Universidade Federal do Rio Grande do Sul, Porto Alegre, RS, Brazil*, ²*Pontifícia Universidade Federal do Rio Grande do Sul, Porto Alegre, RS, Brazil*

Elucidating the Relationships and Diversity of *Hollandichthys* Eigenmann 1909 (Teleostei: Characidae) at Populational and Supraspecific Levels - a Phylogenetic and Phylogeographic Approach

Hollandichthys is a genus of inseminating characid fishes whose relationships and diversity are still undiscovered. Its relationships are uncertain, having been considered as incertae sedis in Characidae. Recent hypothesis set this genus alternatively related to two different genera, *Pseudochalceus* and *Rachoviscus*. *Hollandichthys* has been long considered a monotypic genus living in creeks associated with the Atlantic Forest (one of the most endemic regions in the world), but it hides a great diversity behind a single valid species name - *H. multifasciatus*. To access the phylogenetic relationships of *Hollandichthys* we have analyzed mtDNA and nuclear genes representing 41 Characidae species. To access the evolutionary history of the genus, we have sequenced 201 specimens from 20 populations from all distributional range. We found *Rachoviscus* as sister-group of *Hollandichthys*. Furthermore, the results support the evidence that insemination evolved at least three times inside this family. In the phylogeographic approach, we found a clear separation in two different groups (North and South) in the area of Paranaguá estuary in the Brazilian Coast, dating from 1.9 Mya, and the several populations consistently arranged into five groups that better fits to the diversity of our molecular and geographic dataset. In a general manner, the evolutionary history inferred for this genus is strictly correlated with the climatic changes that caused impact in the Atlantic Forest. A bottleneck would have happened during the last maximum glacial, followed by a population growth that coincides with the expansion of the forest - from small isolated areas to a large continuum.

0779 Poster Session II, Exhibit Hall D, Saturday 10 July 2010; ASIH STORER ICHTHYOLOGY AWARD

Andrew Thompson¹, Luiz Rocha²

¹The George Washington University, Washington D.C., United States, ²The University of Texas Marine Science Institute, Port Aransas, TX, United States

The Systematics and Biogeography of the Atlantic Labrid Species *Bodianus insularis*

Over the past decade, molecular techniques have been established as standard methodology in taxonomy and biogeography studies. Such techniques are often associated with the discovery of previously unrecognized species, sometimes referred to as cryptic species. Here we sequenced two mitochondrial DNA genes from isolated populations of species of the genus *Bodianus* on both sides of the Atlantic and the isolated central Atlantic islands in order to confirm their taxonomic status and estimate phylogenetic relationships between species and populations. The geographic distributions of *Bodianus insularis* and *B. pulchellus* are especially intriguing: the former occurs in the three very isolated islands of Ascension, St. Helena and St. Paul's Rocks, and the latter occurs on both sides of the Atlantic but nowhere in between. Instead of identifying cryptic species, our results indicate that the populations of *B. pulchellus* on both sides of the Atlantic are part of a single species, and that, surprisingly, *B. insularis* from St. Paul's rocks belongs to *B. pulchellus*. *B. insularis* populations from Ascension and St. Helena on the other hand, formed a well defined clade. Thus, the St. Paul's Rocks populations that have been historically identified as *B. insularis* are actually an odd color morph of *B. pulchellus*. While surprising, this result is not completely unexpected, as strange color morphs of other species were previously recorded in the very isolated St. Paul's Rocks.

0005 SSAR S EIBERT ECOLOGY AWARD, 555 AB, Thursday 8 July 2010

Brad Timm¹, Kevin McGarigal², Robert Cook³

¹University of Massachusetts, Amherst, MA, United States, ²University of Massachusetts, Amherst, MA, United States, ³U.S. National Park Service, Cape Cod National Seashore, Wellfleet, MA, United States

Movement Ecology of Eastern Spadefoots (*Scaphiopus h. holbrookii*) in the Province Lands Dunes of Cape Cod National Seashore

The Eastern spadefoot (*Scaphiopus h. holbrookii*) is a regionally threatened species that is locally common at Cape Cod National Seashore (CACO), representing what is likely the largest population in the northeastern United States. Populations of Eastern spadefoots

are few and far between throughout the Northeast, largely the result of the patchy distribution of habitat suitable to this species, most notably sandy/loosely-compacted substrates required for burrowing. This presentation will discuss results obtained from two years of radio-telemetry work conducted on adult Eastern spadefoots at CACO including a discussion of upland habitat preferences, movement patterns, and burrowing ecology. In addition, this presentation will examine the use of fine-scale remote-sensing maps in assessing habitat preferences and in identifying potential locations of Eastern spadefoots in early-successional, pitch-pine/scrub-oak communities.

**0641 Fish Evolution, 555 AB, Saturday 10 July 2010; ASIH STOYE AWARD
GENERAL ICHTHYOLOGY**

Michelle Tipton

Wesleyan University, Middletown, CT, United States

**Phylogeography of the Blacknose Dace, *Rhinichthys atratulus* and
Complications Caused by *Rhinichthys obtusus***

The main goal of this project is to determine the source population or populations of Blacknose Dace, *Rhinichthys atratulus*, which were responsible for the recolonization of Connecticut after the last glacial retreat. This investigation was complicated by the discovery of inconsistent classifications of this species and its sister taxon *Rhinichthys obtusus*. Despite the recent designation of Western Blacknose Dace, *R. obtusus*, as a species distinct from Eastern Blacknose Dace, *R. atratulus*, questions about their taxonomic distinctiveness and distributions remain. Applying physical descriptions to *R. atratulus* and *R. obtusus* in the field presents problems due to their morphological similarity. This has been a complicating factor for conducting phylogeographic analyses of *R. atratulus*. Through genetic sequencing, I am able to distinguish *R. atratulus* from *R. obtusus* which have been misidentified based on morphology in the field or due to incorrect distribution information. Preliminary analyses using two mitochondrial genes, ND2 and control region, find *R. atratulus* and *R. obtusus* to have approximately a ten percent and two percent difference in nucleotide bases, respectively. I hypothesize that these genetic differences are consistent across their ranges. We determined this through more genetic sequencing. Resolving this complication of inconsistent species classification will allow a more accurate determination of how *R. atratulus* recolonized previously glaciated areas. Furthermore, these results have implications for solidifying classification discrepancies, clarifying characteristics for field identification, updating species distributions, and ultimately determining the patterns of post-glacial recolonization.

0529 Karel Liem Symposium, Ballroom D, Friday 9 July 2010

Tim Tkint¹, Erik Verheyen², Dominique Adriaens¹

¹*Ghent University, Ghent, Belgium*, ²*Royal Belgian Institute of Natural Sciences, Brussels, Belgium*

Liem's Paradox Extrapolated: Is There Also a Trade-off Between Mouth Brooding and Feeding in Cichlids?

When Liem published his research on 'modulatory multiplicity' in the late seventies, it seemed to contradict previously formulated hypotheses on the functional performance of highly specialized phenotypes. The fact that some morphologically specialized cichlids retain a wide array of prey capture techniques even became known as Liem's paradox. After initially being written off as laboratory artifacts, his findings were later supported by field observations and an extension of optimal foraging theory explained in what evolutionary context such 'Jack of all trades' specialists could evolve. From a functional morphological perspective the combination of different feeding modes without much compromise was unexpected, but experimental data have shown that in some cases the expected trade-offs can be avoided. We investigated if a similar trade-off is avoided at another level, i.e. whether oral apparatus functionality for feeding is affected by its function for mouth brooding. We determined the theoretical bite force, kinematical transmission coefficient of the anterior-jaw four-bar linkage and several other feeding related aspects for two different trophic types of cichlids from Lake Victoria (*Haplochromis piceatus*, a 'suction feeder' and *H. fischeri*, a 'biter'). By comparing the theoretical performance of males and females of these maternally mouthbrooding cichlids, we could get an idea of how the added constraint of holding as much eggs as possible could affect the functioning of the oral apparatus in food gathering. We also performed a geometric morphometric analysis, which allowed us to visualize any morphological differences between the sexes that might have functional implications.

0230 Poster Session II, Exhibit Hall D, Saturday 10 July 2010

Stephen D. Tonjes

Florida Department of Transportation, Deland, FL, United States

Ledges to Nowhere - Structure to Habitat Transitions

Three roadway projects nearing completion in FDOT District 5 (east central Florida) include modifications to existing bridges and culverts that add ledges for the passage of small wildlife. In all three projects, the ledges ended abruptly at the ends of the structures, with no transition and even significant obstacles between the ledges and the surrounding habitat. Each of the roadway projects was designed independently by a different engineering firm, so the lack of awareness was not limited to one individual

designer or firm. Resolving these issues often results in complicated and expensive coordination. Currently, the design engineers for each project have produced corrected drawings. Modifications are completed or underway, except at one structure, for which the roadway Contractor declined to bid on the changes. A second project to correct the problem will be needed. Small oversights during design and construction can virtually eliminate the usefulness of wildlife passages included in structures. The purpose of this poster is to call attention to problems that are being encountered in the design and construction of wildlife crossing structures that significantly undermine their usefulness to wildlife. Engineers and biologists should collaborate throughout the design process, and biologists should monitor these accommodations during and after construction.

0234 Poster Session II, Exhibit Hall D, Saturday 10 July 2010

Stephen D. Tonjes

Florida Department of Transportation, Deland, FL, United States

Wildlife Ecology for Dummies: Design Elements of Wildlife Crossing Structures – A Literature Review

This poster describes a unique resource available to transportation professionals - planners, project managers and engineers - who are not ordinarily familiar with wildlife ecology, but who must make decisions about the utility and the design of wildlife crossing structures. We surveyed existing literature and summarized in a table format specific recommendations for design elements of wildlife crossing structures. Each recommendation cites the source from which it was taken. The tables are divided into the following sections: crossing structures; fencing and other barriers; approaches and transition zones; animals; traffic; alternatives; and citations. Transportation planners and designers have found this document to be useful in answering specific questions about siting, dimensions, materials, and context of wildlife crossing structures. Transportation professionals generally are not conversant with wildlife ecology literature, and existing transportation ecology studies usually have been designed to answer biological questions instead of engineering questions. We know of no other reference available to transportation professionals that extracts the information they need from this daunting collection. Much more work is needed to make statistically valid generalizations involving all the elements of wildlife crossing structure design. A research project is underway specifically to strengthen and expand these guidelines that transportation professionals can actually use.

0495 Fish Systematics I, Ballroom D, Monday 12 July 2010

Luke Tornabene¹, Carole Baldwin², Lee Weigt², Frank Pezold¹

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Exploring the Diversity of Western Atlantic *Bathygobius* (Teleostei: Gobiidae) with Cytochrome c Oxidase-I

Bathygobius is currently thought to be represented by three species in the western Atlantic: *B. curacao*, *B. mystacium*, and *B. soporator*. Specimens of *Bathygobius* were collected throughout the western Atlantic, and a 650-bp portion of the mitochondrial gene cytochrome oxidase-c subunit I was sequenced to aid in re-examining the species classification of the genus. A neighbor-joining tree was constructed from the sequence data, and voucher specimens from each genetically distinct lineage were subsequently examined for diagnostic morphological characters. The results suggest that there are at least six species of *Bathygobius* in the western Atlantic. Two genetic lineages are identified as *B. curacao* and *B. mystacium*. Three lineages possess characters that would previously have led to their identification as *B. soporator*. One of those is identified as *B. soporator*, although there is genetic structure within that lineage that may require further taxonomic action. A second "*B. soporator*" lineage is identified as *Gobius lacertus*, a synonym of *B. soporator*, and *G. lacertus* is resurrected here as *Bathygobius lacertus* for that lineage. The third "*B. soporator*" lineage and the one remaining genetic lineage cannot be assigned to any nominal *Bathygobius* species and are recognized as new species. Subtle differences in pigmentation, along with some fin-ray and scale characters, distinguish the western Atlantic *Bathygobius* species. Combining molecular and morphological investigations in this study has brought clarity to the taxonomy of a morphologically conservative group of fishes and doubled the number of currently recognized species.

0498 Poster Session II, Exhibit Hall D, Saturday 10 July 2010

Luke Tornabene, Frank Pezold

Texas A&M University - Corpus Christi, Corpus Christi, TX, United States

Phylogenetic Analysis of Western Atlantic *Bathygobius* (Teleostei: Gobiidae): A Total Evidence Approach

The interspecific relationships of the six western Atlantic *Bathygobius* were analyzed using sequence data from the mitochondrial gene cytochrome b and the nuclear gene S7. Eastern Pacific and West African *Bathygobius* were also included in the analysis. Molecular phylogenies for both genes were generated using maximum parsimony, maximum likelihood, and Bayesian methods. Trees from this analysis were also

compared to a phylogeny generated from a cytochrome c oxidase-I data set from a previous study. Despite the highly conserved morphology of western Atlantic *Bathygobius*, and homoplasy in the dataset, some morphological and pigmentary characters mapped onto the phylogenies are diagnostic of clades.

0691 Poster Session III, Exhibit Hall D, Sunday 11 July 2010

Mike Tousignant, Dave Kerstetter

Nova Southeastern University, Davie, FL, United States

Reproductive Periodicity of the Pelagic Stingray, *Pteroplatytrygon violacea*, in the Western North Atlantic Ocean

The pelagic stingray is a moderately sized stingray in the Family Dasyatidae and is the only dasyatid that lives in epipelagic waters. Our current knowledge on the reproductive cycle of the pelagic stingray is limited. It is believed that the pelagic stingray reaches sexual maturity at two years in both sexes, with a gestation period of two to three months. Due to the short gestation period, it has been suggested that the pelagic stingray has either an annual or biannual reproductive periodicity. Specimens of mixed sexes and sizes were collected as bycatch in the pelagic longline fishery from the western North Atlantic, mainly in the South Atlantic Bight (SAB) and Florida East Coast (FEC) NOAA Fisheries pelagic statistical areas. In all, the reproductive tracts of 54 sexually mature males, one immature male, 65 sexually mature females, and two immature females were collected during the period of August 2008 to December 2009. Adult females are gravid in the months of August to February. Adult males had greater testicular weight from August to October. Females collected from March to July were not observed to be gravid while males collected during the same period had significantly ($t = 8.2638$, $P 0.0001$) less testicular weight. These data suggest a possible reproductive cycle starting around August and lasting until February for this population.

0014 Herp Morphology, 556 AB, Sunday 11 July 2010

Stanley Trauth¹, David Sever¹

¹Arkansas State University, State University, AR, United States, ²Southeastern Louisiana University, Hammond, LA, United States

Ultrastructural Observations of the Secretory Epithelium of the Distal Genital Tract in the Flathead snake, *Tantilla gracilis*

We examined the secretory epithelium of the distal genital duct system of reproductively-active male Flathead Snakes, *Tantilla gracilis*, using transmission electron microscopy (TEM). Snakes were collected from the Interior Highlands ecoregion of Arkansas between early April 2007 and mid-May 2008. Specimens were returned to the lab and sacrificed using sodium pentobarbital. The genital ducts were excised and prepared for TEM using routine histological and ultrastructural techniques. We focused our study on three distinct regions of a genital duct: the more proximal ductus deferens, an enlarged distal segment known as the ampulla ductus deferentis, and the most caudal portion, the ampulla urogenital papilla. The secretory epithelial cells in these areas varied from low cuboidal columnar in the ductus deferens to a pseudostratified columnar type within the ampulla ductus deferentis. Apical cell surfaces contained low-to-tall microvilli, and secretory activity ranged from merocrine to an apocrine discharge. Sperm aggregates associate closely with the epithelial surfaces in all ductal regions. It remains unclear as to the functional significance of secretory products released by the epithelia within this duct system.

0544 Herp Conservation III, Ballroom B, Sunday 11 July 2010

Emilie Travis¹, Betsie Rothermel¹, Debra Miller¹, Michaelle Purdee³, Jessica Gonynor³, Michael Yabsley³

¹Archbold Biological Station, Lake Placid, Florida, United States, ²Veterinary Diagnostic and Investigational Laboratory, University of Georgia, Tifton, Georgia, United States, ³Warnell School of Forestry and Natural Resources and Southeastern Wildlife Disease Study, University of Georgia, Athens, Georgia, United States

Population-level Impacts of Emerging Diseases on Red-spotted Newts (*Notophthalmus viridescens viridescens*) at a Blue Ridge Mountains Site in Georgia

We initiated an amphibian monitoring program in 2008 at the Wharton Conservation Center (WCC), a protected site in the Upper Tallulah River watershed of northeastern Georgia. In previous years, we found several pond-breeding species were infected with *Batrachochytrium dendrobatidis* (Bd) and/or *Ranavirus* and observed some disease-

associated mortality. Our objectives were to determine the prevalence of *Bd* and *Ranavirus* in Red-spotted Newts (*Notophthalmus v. viridescens*) and measure the population-level effects of these pathogens on the Red-spotted Newts at the WCC. We installed a drift fence around our main study pond to monitor movements and determine the disease status of different life stages of Red-spotted Newts. In June 2009, we initiated a capture-mark-recapture study of adult Red-spotted Newts, following Pollock's robust design model. We tested adult newts for *Bd* using skin swabs and PCR-based assays and also tail-clipped them upon first capture for *Ranavirus* testing. We estimated survival, capture probability, and population size of Red-spotted Newts by running a set of biologically meaningful models in Program MARK. Preliminary analyses suggested there was high survival of adults and we documented successful reproduction, despite high prevalence of *Bd* infection. *Bd* prevalence varied by season and we discovered that individuals were apparently able to clear themselves of *Bd* infection. Prevalence of *Ranavirus* was found to be low, but will continue to be monitored. We have little evidence of negative disease impacts on this Red-spotted Newt population, but we plan to continue intensive monitoring at this site as part of a multi-species monitoring effort throughout 2010.

0564 Poster Session I, Exhibit Hall D, Friday 9 July 2010

Krystal Tronboll, Andrew Bohonak

San Diego State University, San Diego, CA, United States

Historical Biogeography of Slender Salamanders in Southern California

Salamanders often feature in studies of fundamental evolutionary processes. Here, we use geographic and genetic data from a group of small, terrestrial plethodontids to investigate adaptive and non-adaptive speciation in a spatially explicit context. In San Diego County, the taxon recognized as *Batrachoseps major* is comprised of two parapatrically distributed mtDNA clades, with haplotypes from both clades known to occur in or near sympatry at several localities. Despite approximately 9% mtDNA divergence, allozymes and morphology do not support the hypothesis that these clades are distinct evolutionary lineages. The data have been interpreted as evidence for a widespread ancestor fragmented by sharp tectonic and climatic shifts. Isolated groups are thought to have differentiated in allopatry, followed by male-mediated dispersal from refuges. In this study, we use both mitochondrial and nuclear sequence data to examine the degree to which ancient and contemporary rivers and floodplains may have shaped the evolution of this species. This work elucidates the evolutionary history and trajectory of *Batrachoseps* in southern California, and contributes data relevant to the general phenomenon of amphibian species declines.

0090 Poster Session II, Exhibit Hall D, Saturday 10 July 2010; ASIH STORER ICHTHYOLOGY AWARD

Chun-Hsin Tsai, Sheng-Hai Wu

National Chung-Hsing University, Taichung, Taiwan

A Comparison of Fish Assemblages Between Marsh Grass Bed and Cleared Habitats in a Protected Coastal Wetland in Taiwan

We studied the ichthyofauna in the Kaomei wetland, a protected intertidal coastal wetland covering the largest bulrush marsh grass bed in western Taiwan. Fishes were collected by consecutive day and night sampling using fyke nets on eight sampling surveys at four sites (2 marsh grass bed and 2 cleared habitats) between September 2006 and September 2007. Marsh grass sites includes natural *Bolboschoenus planiculmis* and a few mangrove stands; and cleared sites have sandy or mudflat substrates without vegetation. A total of 2984 individuals weighing 34 kg were caught during the study period, which belonged to 27 families and 43 species. Gobiidae was the most diverse family (6 species), followed by Leiognathidae (4 species). The fish community was dominated by the grass puffer fish (*Takifugu niphobles*, representing 36% of individuals) and the three-striped tiger fish (*Terapon jarbua*, representing 21% of individuals), the two species accounted for 57% of the total catch. Some species were specific to a particular habitat type: 15 species were found exclusively in marsh grass habitats and 14 species were limited to cleared sites. Analysis of similarities demonstrated that fish assemblage structures were different between the marsh grass bed and cleared sites ($p = 0.001$). The results indicated that coastal wetland ecosystem were important habitats for fishes, the grass bed and sandy (mudflats) function as nursery sites for specific fish species.

0430 Poster Session I, Exhibit Hall D, Friday 9 July 2010

Hui-Shan Tsai, Ya-Hui Yang, Sheng-Hai Wu

Department of Life Science, National Chung-Hsing University, Taichung City, Taiwan

Signals from Tadpole Buccal Structures: Phylogenetically or Environmentally Constrained?

The tadpole buccal cavity structures are the fine features in the inner cavity of tadpole's head-body part. Recent researches show that there are some phylogenetically signals from these structures. This study surveyed the buccal structures of 8 species of Taiwan anuran tadpoles of two ecomorphological types: the lentic and lotic forms. We recorded buccal cavity characters from scanning micrographs and performed phylogenetic analyses. If tadpole characters contain mainly phylogenetic information, species in the same taxonomic category should be grouped together. On the other hand, if tadpole

characters reflect adaptation, species of the same ecomorphotype should be grouped together. A total of 59 buccal characters were observed, including previously undescribed ontogenetic changes. Two bufonid species are grouped together in all analyses, regardless of the ecomorphotypes of the outgroup taxa. Furthermore, evolutionary trees rooted by different ecomorphotype of outgroups do not result in the grouping of similar ecomorphotype in the same clade. It suggests some characters contain phylogenetic information. Ecomorphological pattern emerged from most trees suggests some oral structures are environmentally determined. Buccal characters examined in this study exhibit more environmental rather than phylogenetic signals, but are useful for lower level taxonomy.

0015 Headstarting Turtle Symposium II, Ballroom B, Monday 12 July 2010

Tracey Tuberville¹, Kurt Buhlmann¹, Terry Norton², Brett Moule³, Veronica Greco²

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Headstarting as a Management Component for Gopher Tortoises (*Gopherus polyphemus*): Results and Observations from Three Study Sites

Numerous turtle population viability models have concluded that juvenile survivorship is the most influential parameter on population trends after adult survivorship, suggesting that increasing juvenile survivorship (either through habitat manipulation, predator control, or headstarting) might prove to be a useful management target. However, little is known about the survivorship and ecology of juveniles of most turtle species, including even well-studied species such as the gopher tortoise. The limited data available on the fate of head-started gopher tortoises further constrains attempts to evaluate headstarting as a management tool. We will summarize juvenile mark-recapture data from reintroduction projects for gopher tortoises at three study sites (Savannah River Site, SC, 2002-2006; St. Catherines Island, GA, 2006-2009; Aiken Gopher Tortoise Preserve, SC, 2008-2009), including a comparison of the survivorship and growth in head-started and naturally-recruited individuals. Based on these results and our field observations, we will evaluate the utility of headstarting under different management scenarios, describe the problems encountered, and provide recommendations for improving implementation.

0361 Poster Session III, Exhibit Hall D, Sunday 11 July 2010

Derek Tucker, Lance McBrayer

Georgia Southern University, Statesboro, GA, United States

Studying the Effects of Habitat Type on Locomotor Performance when Negotiating an Obstacle Using the Florida Scrub Lizard (*Sceloporus woodi*)

Jumping is a component of performance used by many vertebrates to navigate three-dimensional habitats. As a performance trait, jumping can be important in predator evasion, prey capture, and overcoming physical barriers encountered during walking or running. The Florida scrub lizard (*Sceloporus woodi*) is endemic to the Florida sand-pine scrub and longleaf pine habitats of central Florida. *S. woodi* is found in both habitat types because each contain open sandy areas with little ground cover and arboreal perches. The Florida scrub lizard is a mostly terrestrial lizard that exhibits some arboreal behavior in longleaf pine habitat. Lizards jump on and off the base of trees in longleaf pine and onto perches for displaying and thermoregulation in scrub. The purpose of this study is to test whether running and jumping ability differs between lizards from scrub and longleaf pine habitats when confronted with an obstacle that they must jump or climb. Lizards were captured in the summer of 2009 in the Ocala National Forest. Locomotor performance trials were conducted in the Animal Care Facility at Georgia Southern University. A customized chamber 90 cm x 61 cm x 20 cm (L x H x W) was constructed for the trials. Two CASIO high speed video cameras recording at 300 frames/second were used to quantify the maximum velocity and acceleration as the lizard approached the obstacle (logs of varying size), the behavior exhibited (run onto log, jump over, hide under, etc.), jump angle, and jump distance onto the log.

0571 Fish Systematics I, Ballroom D, Monday 12 July 2010

Peter Unmack, Dennis Shiozawa, Paul Evans

Brigham Young University, Provo, UT, United States

A Mitochondrial DNA Phylogeny of *Oncorhynchus clarkii*, Cutthroat Trout

Approximately 14 subspecies of *Oncorhynchus clarkii*, Cutthroat Trout are recognized from western North America. Most populations are seriously threatened or endangered mostly due to introgression, predation and competition from introduced trouts as well as general habitat degradation. Many of these impacts occurred so early that the original distributions of some subspecies are incompletely known. Much genetic work has been conducted on different subspecies mostly aimed at determining levels of introgression. Here we present data from multiple protein coding mitochondrial genes in a combined analysis to investigate broader phylogenetic patterns across the range of the species. Three main groupings were found, a basal cluster consisting of *O. c. clarkii*, Coastal

Cutthroat Trout, *O. c. henshawi*, Lahontan Cutthroat Trout and *O. c. lewisi*, Westslope Cutthroat Trout. The last two groups are sister lineages, with one consisting of *O. c. bouvieri*, Yellowstone Cutthroat Trout and *O. c. sp.*, Bear River Cutthroat Trout. The last lineage consists of *O. c. pleuriticus*, Colorado River Cutthroat Trout, *O. c. stomias*, Greenback Cutthroat Trout, *O. c. virginalis*, Rio Grande Cutthroat Trout and *O. c. utah*, Bonneville Cutthroat Trout. We found moderate to strong resolution between the three lineages, but mostly poor resolution within each lineage. Aspects of the biogeographic history of the group will be discussed and compared with previous hypotheses.

0398 Acoustics Symposium II, Ballroom D, Saturday 10 July 2010

Eva Ursprung, Max Ringler

University of Vienna, Department of Evolutionary Biology, Vienna, Austria

Calling Activity, Territory Size and Reproductive Success in the Dendrobatoid Frog *Allobates femoralis* (Aromobatidae) – An Integrative Approach

Acoustic signalling is found in almost all anuran amphibians and serves to attract mates as well as to announce area occupancy in territorial species. In the dendrobatoid frog *Allobates femoralis* (Aromobatidae) males use distinct advertisement calls to announce their multi-purpose territories and to attract females. The phonotactic behaviour of *A. femoralis* males to conspecific advertisement calls allows for measurement of territory sizes with playback experiments. At the border of the territory the resident male stops approaching the loudspeaker, starts antiphonal calling or turns back to his previous calling position. Hence, two types of territories can be defined: calling territories and playback territories. Males form calling communities with inter-territory distances of 15 metres where each individual has several calling neighbours at the same time. To maximize the efficiency of the calling effort, callers adjust their performance to the calling behaviour of neighbours by call alternation as well as avoidance of bout overlap. In 2009 we performed playback experiments to determine territory sizes while in 2010 we simultaneously recorded a calling community of *A. femoralis* males to quantify calling activity. In both years we sampled genetic material of adults and tadpoles from clutches and artificial pools, for parentage analysis. We will present the methodology and first results of this ongoing study. In a future study we will combine these acoustic, spatial and genetic analyses in an integrative approach to investigate the relevance of calling activity and territory size on mating and reproductive success.

0313 Poster Session I, Exhibit Hall D, Friday 9 July 2010

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Phylogeography of Peruvian Geckos in the *Phyllodactylus microphyllus* Group

Leaf-toed geckos in the genus *Phyllodactylus* are endemic to Central and South America, and the West Indies. The paired distal “leaf-toed” scansors of these rupicolous geckos are an adaptation for living among rocks, often in semi-arid habitats. The evolutionary relationships among species of South American *Phyllodactylus* are unknown and herein, we focus on populations of the *P. microphyllus* species group from the western side of the Peruvian Andes. We sequenced 315 base pairs (bp) of the mitochondrial cytochrome b gene and 1,017 bp of the recombination-activating gene-1 (RAG1), and analyzed these data with maximum likelihood (GARLI) and Bayesian analysis (Mr. Bayes 3.0). Results indicated that populations of *P. microphyllus* are not monophyletic—populations from Huacho, Peru (near Lima) represent an undescribed taxon that is sister to *P. lepidopygus*. Other populations of *P. microphyllus* from northwestern Peru are monophyletic, but form at least three divergent clades: Bayovar (near Piura), Isla Santa (near Ancash), and several beach localities near Chiclayo (close to the type locality in Lambayeque Dept.). Our results suggest taxonomic changes are necessary for the *P. microphyllus* group, including the description of at least one new species.

0306 Poster Session III, Exhibit Hall D, Sunday 11 July 2010

James Van Dyke, Steven Beaupre

University of Arkansas, Fayetteville, AR, United States

Enriched Stable Isotope Tracers Indicate Income Allocation in Putative Capital Breeding Snakes

Mechanisms by which resources are allocated to competing functions are key components of individual life histories, and may explain variation in life-history traits. Reproductive allocation strategies are traditionally separated into dichotomous extremes based on body condition changes during the reproductive cycle. Capital breeders lose body mass and are hypothesized to allocate stored resources to reproduction. Income breeders do not lose body mass, and are hypothesized to allocate immediate food resources to reproduction. However, physiological mechanisms underlying differences between capital and income strategies have not been identified. We examined the ability

of five viviparous snake species, including putative capital and income breeders, to allocate income resources to eggs during vitellogenesis. We fed ^{15}N -labeled L-Leucine to experimental groups of 4-7 females of each species during vitellogenesis, while control groups of 4-7 females were not fed enriched diets. ^{15}N -ppm of yolks, obtained by yolkectomy, was then measured using mass spectrometry. Scale samples taken prior to supplementation were used to estimate background "capital" ^{15}N -concentrations, and scale samples taken at ovulation were used to estimate the amount of ^{15}N -leucine assimilated from enriched diets. Yolks of enriched females were significantly more enriched in ^{15}N than yolks of non-enriched females in all species, indicating significant allocation of income to yolk during vitellogenesis, regardless of putative allocation strategy. Our results suggest that apparent capital-income allocation strategies are not based on physiological differences, but are consequences of timing of foraging success relative to vitellogenesis. These data cast doubt on the capital-income dichotomy as representative of a life-history adaptation.

0310 Herp Development, 556 AB, Sunday 11 July 2010

James Van Dyke, Steven Beaupre

University of Arkansas, Fayetteville, AR, United States

Estimating Reproductive Effort in Viviparous Snakes: Metabolic Costs of Vitellogenesis

Reproductive effort is a central concept to life history theory and reproductive energetics. Components of reproductive effort include energy contents of allocations to offspring and metabolic costs of reproductive processes. Regardless of reproductive mode, most reptiles are lecithotrophic, and reproductive allocation primarily occurs during vitellogenesis. However, most investigations of reproductive effort focus on metabolic costs of pregnancy or gravidity. We estimated metabolic costs of vitellogenesis and pregnancy in five species of viviparous snakes (*Agkistrodon contortrix*, *Nerodia sipedon*, *Thamnophis sirtalis*, *Boa constrictor*, *Eryx colubrinus*) by measuring oxygen consumption rates at critical periods before, during, and after vitellogenesis, at ovulation, during pregnancy, and after parturition. Within-species comparisons showed that total oxygen consumption during vitellogenesis was not significantly different from that during pregnancy for all species except *N. sipedon*, in which oxygen consumption was greater during pregnancy. Similarly to other studies of metabolic costs of pregnancy, sums of post-partum litter and maternal oxygen consumption rates were either not significantly different from (*N. sipedon*, *T. sirtalis*, *E. colubrinus*), or significantly greater than (*A. contortrix*, *B. constrictor*), our estimates of pre-partum maternal oxygen consumption rate in all species. This suggests that much of elevated oxygen consumption during pregnancy results from neonatal growth and maintenance rather than maternal effort. As a result, maternal oxygen consumption during vitellogenesis may exceed that of pregnancy after accounting for offspring demands. Metabolic costs of

vitellogenesis constitute a significant portion of reproductive effort that may vary on organismal, temporal and geographic scales, and warrant further investigation.

0327 Poster Session III, Exhibit Hall D, Sunday 11 July 2010

Marat Vasilenko¹, Rick Blob², Margaret Ptacek², Eric Schultz¹

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Components of Mating Behavior and Temporal Predictors of Mating Success in Mollies (*Poecilia: Mollienesia*)

Livebearing fishes in the subfamily Poeciliinae are subjects of a large literature on how primary and secondary sexual characters have diversified in response to natural and sexual selection. Despite this long-standing interest there has been little quantitative analysis of mating behavior. We collected high-speed (500 frames per second) videographic sequences of mating attempts without courtship in five species of *Poecilia*, comprising repeated observations of six to ten captive males of varying size in each species, with both receptive and unreceptive females. Each sequence was scored with respect to copulatory success, evaluated as whether the tip of the gonopodium contacted the urogenital area of the female. We observed three distinct phases in the mating sequence: 1) circumduction of the gonopodium, 2) approach to the female, and 3) proximity to the gonopore. The three phases comprise roughly 25%, 25% and 50% of total event time, respectively. We scored the duration of each phase and tested for differences among males, among species, between receptive and unreceptive females, and between successful and unsuccessful copulations. Success was typically associated with a briefer circumduction phase (i.e. more rapid motion of the gonopodium), a more rapid approach, and a more prolonged period of proximity. These results suggest that there is a selective benefit for rapid precopulatory movements and for prolongation of time in close contact with the female.

0127 AES Feeding Symposium I, 552 AB, Saturday 10 July 2010; AES GRUBER AWARD

Jeremy Vaudo, Michael Heithaus

Florida International University, North Miami, FL, United States

The Effects of Sampling Unit and Sample Size on Stable Isotopic Community Metrics in a Batoid Community

Stable isotopic analysis is becoming an increasingly popular technique in elasmobranch ecology, but sample sizes of these large predators are often low. Using data from a nearshore batoid community, we examined the effects of using individuals as the sampling unit and sample size on a variety of community isotope metrics. The ranges of d15N and d13C for the batoid community increased substantially when calculated using individuals as opposed to species means (2.7x and 1.9x, respectively). In addition, total niche area for the community was 6.2x larger when calculated using individuals. Sample size had little effect on the estimates of mean d15N and d13C values. Estimates of d15N and d13C range and total niche area, however, initially increased dramatically with sample size before approaching an asymptote. These results suggest small sample sizes and examining communities using mean d15N and d13C values for species may greatly underestimate the niche space occupied and trophic complexity of elasmobranch communities. We recommend the use of individuals as the sampling unit and rarefaction curves to determine if individual species have been adequately sampled for the stable isotopic analysis of elasmobranch communities.

0115 Headstarting Turtle Symposium II, Ballroom B, Monday 12 July 2010

Juliette Veloso¹, Randriamahita ¹, Floriot Randriamangason¹, Ernest Bekarany¹, Gerardo Garcia², Gerald Kuchling³, Richard Lewis¹, Lance Woolaver¹

¹Durrell Wildlife Conservation Trust, Antananarivo, Madagascar, ²Durrell Wildlife Conservation Trust, Jersey, United Kingdom, ³University of western Australia, Nedlands, Australia

Reinforcing Through Head-starting a Population of *Erymnochelys madagascariensis* at Ankarafatsika National Park Madagascar

Head-starting of the critically endangered endemic Malagasy turtle *Erymnochelys madagascariensis* started in 1999 in Ampijoroa, Madagascar, to promote recovery of turtle populations in Ankarafatsika National Park which had been depleted by human exploitation. Through collaboration with local people hatchlings from protected wild nests from a small but relatively healthy population are taken into captivity and head-started for several years prior to release into another wetland with a depleted

population in the same drainage system. During 1999 and 2000 all (139) hatchlings from 14 wild nests were collected for head-starting. Since 2001 only two hatchlings per nest (about 11%) are taken into captivity and the majorities are released directly into the adjacent wetlands, with 14 to 32 nests found annually and 10 to 44 hatchlings brought into captivity. During the 10 years of head-starting, the death rate in captivity has been less than 4% and the growth rate is higher in captivity than in wild populations. In March 2004 and November 2009, 158 and 180 head-started individuals were released into Ankomakoma Lake. This reinforced population is monitored twice a year. For the first release, the survival probability of released juveniles and re-capture probability is 0.96 and 0.56 respectively. The population at the release site is growing. Due to a high natural predation rate of wild hatchlings and small juveniles, head-starting is a useful method to speed up the recovery of depleted *Erymnochelys madagascariensis* populations once the cause of decline has been addressed and removed.

0525 General Ichthyology, Ballroom B, Friday 9 July 2010

Jonathan Velotta¹, Arne Christensen², Stephen McCormick², David Post³, Eric Schultz¹

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Microevolutionary Changes to Osmoregulatory Physiology in Alewife (*Alosa pseudoharengus*)

Transitions between salt and fresh water, which are deeply rooted in vertebrate evolution, require multiple concerted changes to osmoregulatory systems. Considerable work has been conducted on proximate changes in these systems, based on the responses of euryhaline fishes to varying salinity and on ontogenetic changes in anadromous fishes. The ultimate context for these changes is poorly understood. For instance, it is not known whether performance in fresh water trades off against performance in salt water. We are investigating this question in the alewife (*Alosa pseudoharengus*), an ancestrally anadromous fish in which multiple, independently derived FW only (landlocked) populations have evolved. Specifically, we are testing whether landlocked alewives exhibit reduced osmoregulatory function in salt water and/or enhanced osmoregulatory function in freshwater as compared to anadromous alewives. YOY alewives from landlocked and anadromous populations have been experimentally challenged with a range of salinity levels. Whole-organism osmoregulatory performance was assessed by measuring survival and plasma osmolality after the salinity challenge. Osmoregulatory processes were measured as the abundance of critical ion cotransporters, as well as the abundance and activity level of sodium-potassium ATPase. Osmoregulatory performance and sodium-potassium ATPase activity are reduced among landlocked alewives challenged in SW, indicating

that adaptation to an FW-only lifecycle results in a loss of SW function. No changes in FW function have yet been detected.

0210 Fish Community Ecology, 555 AB, Monday 12 July 2010

Francis Veraldi

US Army Corps of Engineers, Chicago, IL, United States

A Brief Synopsis of the Chicago Area Waterway System and the Potential Dispersal of Asian Carps and Other Non-Indigenous Fishes: A Technical Perspective

The dispersal of Asian carp species, silver carp (*Hypophthalmichthys molitrix*) and bighead carp (*H. nobilis*) through the Illinois River and into the man-made Chicago Area Waterway System (CAWS) has caused great public alarm in that these invasive and adaptable species may succeed in over taking the Great Lakes as they have in the Mississippi River basin. Historically, a natural biogeographic nexus intermittently occurred during high water where species between the Mississippi River and the Great Lakes would naturally intermingle. The permanent man-made connection, in conjunction with non-native species introduction (both accidentally and purposefully); however, poses a great challenge to water resource managers and agencies. There is an enormous amount of information, analysis, debate and philosophy for one to digest in making a personal decision of what is fact, fiction or speculation. This brief synopsis is more or a less a back brief to the Ichthyology community of practice on what some of the basic facts are in terms of history, ecology, invasive species and ongoing projects.

0396 Poster Session II, Exhibit Hall D, Saturday 10 July 2010

Jessica Veysey, Kimberly Babbitt

University of New Hampshire, Durham, NH, United States

Forested Buffer Width Impacts the Size-Class Structure of Pool-Breeding Amphibians

Forested buffers are a common suggested management approach for pool-breeding amphibians in eastern North America, yet the effects of buffer width on amphibian-population size structure have not been experimentally tested. We used clear cutting to experimentally manipulate forested buffer widths at 11 vernal pools in central Maine. Each pool was randomly assigned to one of three possible treatments: >1000-m buffer (i.e., an uncut, reference treatment), 100-m buffer, or 30-m buffer. From 2004 to 2009, we captured and measured all adult spotted salamanders (*Ambystoma maculatum*) and wood

frogs (*Lithobates sylvaticus*) using these pools. We constructed size-class categories for length, mass, and body condition, for each sex of each species. We used contingency tables and log-linear regression to assess whether the distribution of individuals across size classes was dependent on treatment and year. In general, for both species, animals from the 30-m treatment were more likely to be shorter, weigh less, and have worse body condition, than animals from the reference or 100-m treatments. We observed, however, notable variations to this pattern for the different sexes across years. Our findings suggest that 30-m buffers may not effectively mitigate the impacts of forest disturbance on spotted salamander and wood frog size-class distribution. The observed impacts on size class structure may have important implications for breeding-population size. Additional research is needed to determine the mechanism driving the interaction between forest disturbance, buffer width, and size class structure.

0211 Poster Session I, Exhibit Hall D, Friday 9 July 2010

Cesar Villanueva¹, Eli Greenbaum¹, Chifundera Kusamba², Mwenebatu Aristote³

¹University of Texas at El Paso, El Paso, TX, United States, ²Centre de Recherche en Sciences Naturelles, Lwiro, South Kivu, Congo, the Democratic Republic of the, ³Institut Supérieur d'Ecologie pour la Conservation de la Nature, Katana, South Kivu, Congo, the Democratic Republic of the

A Molecular Phylogeny of the African Lizard Genus *Adolfus* (Squamata: Lacertidae), with Evidence of a Cryptic Species from the Itombwe Plateau of the Albertine Rift

Currently, four species of the lacertid lizard genus *Adolfus* are known from Central and East Africa, including *A. africanus* (mid to low elevation forests from Cameroon to Kenya), *A. alleni* (montane moorlands of Kenya and Uganda), and *A. jacksoni* and *A. vauereselli* (both known from mid to high elevation forests in countries surrounding the Albertine Rift). We sequenced 2316 bp of two mitochondrial (16S and cyt b) and two nuclear (RAG1 and cmos) genes from 43 samples of *Adolfus* (representing every species except *A. alleni*) and six lacertid outgroups (*Acanthodactylus*, *Algyroides*, *Iberolacerta*, *Lacerta*, *Podarcis* and *Timon*). Data from DNA sequences were analyzed with maximum-likelihood and Bayesian inference criteria with the programs GARLI and MrBayes after appropriate models of nucleotide substitution were identified in the program jModelTest. Results confirmed the monophyly of the genus *Adolfus*, and suggest *A. africanus* and *A. jacksoni* are sister taxa. Populations of *Adolfus vauereselli* included two well-supported, divergent clades from forests of the Albertine Rift (representative of the type locality) and high-elevation grasslands of the Itombwe Plateau of eastern Democratic Republic of the Congo. Morphological analysis of the Itombwe specimens identified several distinct features that suggest the population is a new cryptic species. The recognition of this new, endemic species underscores the conservation importance of the Itombwe Plateau, a unique ecosystem that is severely threatened by unchecked deforestation and poaching.

0460 Turtle Ecology & Conservation, 555 AB, Friday 9 July 2010

Richard C. Vogt¹, Gilmar Klein², Camila Rudge-Ferarra¹

¹Instituto Nacional de Pesquisas da Amazonia, Manaus, Amazonas, Brazil, ²Instituto Chico Mendes de Biodiversidad, Porto Trombetas, Para, Brazil

Posthatching Migration of Hatchling *Podocnemis expansa* with Adults in the Rio Trombetas, Para, Brazil

Movements of hatchling freshwater turtles once they enter the water have not been studied in detail. As a compliment to our study of *Podocnemis expansa* in the Trombetas River in the Amazon Basin of Brazil we attached 3 g VHF transmitters to 10 hatchlings and 50 g transmitters to 3 adult females and released them on the nesting beach, Praia Jacare, at 0830h 14 December along with 2000 other hatchlings. Our goal was to determine the feasibility of following hatchlings to determine their migration patterns and document the possibility that they might be migrating with adult females to the flooded forests. Four hatchlings were never recorded after release. Six were recorded 2 to 11 times at different way points, the final record of a hatchling was 4 days later at GPS point 217 in 4.5 m of water. One hatchling was recorded at 11 different way points, twice after 3 days, and once after 4 days. Of the 217 way points where turtles with transmitters were noted five of the points had adults and hatchlings, one point, after 3 days had 3 hatchlings still migrating together. One area, waypoints 186-190, had females and hatchling surfacing together, after 3 days moving down river. These data indicate that hatchlings and females are migrating together in groups, warranting the expenditure for sonar transmitters, so that the movements of adults and hatchlings can be monitored as they migrate downstream to the flooded forests in the lakes, up to 120 km from the nesting beach.

0252 Poster Session III, Exhibit Hall D, Sunday 11 July 2010

Jaymie Voorhees, Lorin Neuman-Lee, Stephen Mullin, Karen Gaines

Eastern Illinois University, Charleston, IL, United States

Lipid Concentrations in Neonate Watersnakes (Colubridae: *Nerodia*) as a Function of In Utero Exposure to Atrazine

As a component of a commonly-applied herbicide, atrazine is known to disrupt endocrine function in a number of vertebrate species. Recent studies have established links between the intensity of endocrine disruption and the amount of lipid accumulation in various tissues. Viviparous watersnakes provide a model system in which we investigated the relationship between lipid levels in the livers of neonate snakes that had been exposed to atrazine in utero via their mothers' diets. We fed fish

laced with one of four atrazine concentrations to adult female watersnakes (*Nerodia sipedon*) throughout their gestation. Upon birth, we removed all liver tissue from the euthanized neonates and determined the mass of each sample. We assayed the amount of fat deposition in these tissue samples by exposing them to a chloroform-methanol extraction method. We discuss our results with respect to both the potential for indirect negative impacts of atrazine on non-target organisms, and the importance of examining one of several possible endpoints that indicate the intensity of atrazine exposure.

0475 Poster Session I, Exhibit Hall D, Friday 9 July 2010

Joseph Waddell, William Crampton

University of Central Florida, Orlando, Florida, United States

Environmental Conductivity and Sexual Dimorphism in a Genus of South American Electric Fishes (*Brachyhypopomus*)

The Amazon basin is a mosaic of habitat types, which can vary dramatically in conductivity. Morphology of the caudal filament, which is comprised mainly of electric cells (electrocytes), has been shown to correlate with conductivity levels in a manner that maximizes power output. Species in low conductivity habitats typically exhibit a serial-configuration of electric cells - i.e. long, thin caudal filaments, while species in high conductivity habitats exhibit a parallel-configuration - i.e. wide, thick tails. This pattern is often exaggerated during the breeding season, where males of certain species exhibit caudal filaments wider or longer than females, thus producing more powerful signals. While this pattern has been shown previously in a small number of species (n=5), we expand the correlation to the rest of the genus *Brachyhypopomus* (n=28), focusing on species found in the Amazon basin. This allows for a more robust statistical assessment that we accomplish using a suite of tests: ANCOVA, t-tests, MANOVA, and discriminant function analysis. For species that exhibit sexual dimorphism, we found statistically significant differences in tail size between males and females, exaggerated in shape as predicted by environmental conductivity. We also empirically correlated electrocyte arrangement with habitat conductivity for *Brachyhypopomus*, and placed these characters onto a phylogeny. This project is the first to empirically test for a correlation between habitat conductivity and tail morphology using the comparative method (in order to remove the effect of phylogenetic inertia), thereby strengthening the case for the evolution of these characters as a response to environmental conductivity.

0121 Herp Conservation II, Ballroom B, Sunday 11 July 2010

Hardin Waddle¹, Robert Dorazio², Susan Walls²

¹*U.S. Geological Survey, National Wetlands Research Center, Lafayette, LA, United States*, ²*U.S. Geological Survey, Southeast Ecological Science Center, Gainesville, FL, United States*

Presence of Invasive Cuban Treefrog Reduces Probability of Occurrence of Native Treefrog Species in Southern Florida

The Cuban treefrog, *Osteopilus septentrionalis*, an introduced species in southern Florida, USA, represents a potential threat to native treefrog species, but the ecological consequences of this invasive species are not fully known. We developed a new model for estimating patterns of co-occurrence of interacting species in which the occurrence of one species is assumed to depend on the occurrence of another, but the occurrence of the second species is not assumed to depend on the presence of the first species. We assessed whether the occurrence probabilities of native treefrog species differ in the presence and absence of Cuban treefrogs while accounting for differences in occurrence associated with differences in habitat. We found that sites occupied by Cuban treefrogs were 9.0 times less likely to contain green treefrogs and 15.7 times less likely to contain squirrel treefrogs compared to sites without Cuban treefrogs. We found no evidence of an effect of Cuban treefrog presence on the detection of the native species, indicating that their behavior is not altered by the presence of the Cuban treefrog. We also found a significant effect of longitude on the occurrence of Cuban treefrogs which supports our hypothesis that these frogs are invading from the assumed source to the west of our study area. Our model is not able to determine the mechanism by which the native treefrog species are excluded from sites, but other studies indicate that Cuban treefrogs are predators of these species, and they likely also compete for common resources.

0030 Lundberg Symposium, Ballroom D, Sunday 11 July 2010

Peter Wainwright

University of California, Davis, CA, United States

John Lundberg's Influence: Tree Thinking, Fossils and Functional Innovations in Parrotfishes

My first exposure to phylogenetic thinking and the importance of fossils to understanding the evolution of functional morphology came from John while I was an undergraduate at Duke in the late 1970s. It is remarkable to me how sustaining these themes have been and how far we've come since those days. I celebrate John's influence with a discussion of our current work on the impact of feeding innovations on

diversification of parrotfishes. We tested for changes in the rate of evolution of functional morphological traits of the jaws following the origin of two separate innovations. Using a time-calibrated molecular phylogeny and functional morphological traits from 120 species of labrid fishes we found no evidence of changes in jaw evolution following the origin of the parrotfish pharyngeal jaw that permits their unique feeding biology. However, parrotfish with an intramandibular joint show up to 8x faster evolution of oral jaw traits, a pattern that supports the role of this innovation in spurring diversification of parrotfish feeding systems. Our insights depend on estimates of phylogenetic relationships among species and the time-course of diversification, with the later being achieved through the use of fossils in time-calibrating the phylogeny. John was ahead of his time in 1979 but his message is perhaps even more relevant today: phylogenies are crucial to the organization of evolutionary hypotheses and fossils anchor our estimates of when events occurred. With the addition of key modern methods to these fundamentals new insights are rolling in on what shaped diversification of fishes.

0553 AES Morphology, 552 AB, Sunday 11 July 2010

Jessie Waitt¹, Michelle Degrin¹, John F. Morrissey¹, Donna M. McLaughlin²

¹Sweet Briar College, Sweet Briar, VA, United States, ²Central Virginia Community College, Lynchburg, VA, United States

Morphological Variation of the Placoid Scales and Teeth of Chain Catsharks, *Scyliorhinus retifer*: The Influence of Body Location, Age, and Sex

The morphology of placoid scales and teeth of elasmobranchs has long been viewed as being of taxonomic and phylogenetic importance. Unfortunately, an appreciation for morphological variation of these structures due to differences in sex, age, or anatomical position has not been achieved. In an effort to document this variation in chain catsharks (*Scyliorhinus retifer*), samples of placoid scales were taken from 19 body locations of both sexes at all ages (neonate through adult) and examined with a scanning electron microscope. Similarly, teeth from both jaws of both sexes at all ages (neonate through adult) were examined via light and scanning electron microscopy. Substantial and significant morphological differences due to age, sex, and anatomical position were found in both the placoid scales and teeth of this shark. The easily demonstrable variation in these hard parts is contextualized in terms of swimming behavior, dietary shifts during ontogeny, and systematics.

0182 Poster Session I, Exhibit Hall D, Friday 9 July 2010

Christina J. Walker, James J. Gelsleichter

University of North Florida, Jacksonville, FL, United States

The Use of Metallothionein as a Biomarker for Toxic Metal Exposure in Sharks: Associations Between MT Expression and Mercury Concentration in Muscle in *Sphyrna tiburo*

The development of a biomarker to detect metal toxicity in high-risk shark populations is a necessary step in beginning to evaluate the impacts of heavy metal exposure in these animals and their relatives, based on their tendency to accumulate high levels of metals due to their life history characteristics. Metallothionein (MT), an intracellular protein involved in metal regulation and toxicity, is one possible biomarker, having been previously shown to increase in production in the presence of elevated metal concentrations in some organisms. The objective of this study was to evaluate the use of MT as a biomarker for heavy metal exposure in sharks by examining associations between MT expression and methylmercury concentrations in muscle from bonnethead *Sphyrna tiburo*, which have been shown to accumulate potentially toxic levels of this metal. Muscle samples from *S. tiburo* from three Florida Gulf coast locations were used for immunoblotting, using a polyclonal MT antibody against cod, to determine the presence of MT. Mercury (Hg) concentrations were measured in the same samples using EPA Method 7473. The associations between metal concentrations and MT levels will be discussed.

0239 Acoustics Symposium I, Ballroom D, Saturday 10 July 2010

Carrie Wall, Peter Simard, David Mann

University of South Florida, College of Marine Science, St. Petersburg, FL, United States

Fish Passive Acoustics in the Gulf of Mexico: Knowing the Unknown

While it is widely known that numerous fish species produce sound, discerning when and from what species is more challenging. Through the use of autonomous passive acoustic technology, we aim to document the spatial and temporal patterns of fish sound production in the eastern Gulf of Mexico, where many commercially and recreationally important species reside. Two methods have been employed off west-central Florida: moored passive acoustic arrays deployed in 2008 and 2009 covering 800 km² to over 16,600 km² from the coast to 100 m deep, and autonomous gliders with integrated hydrophones deployed cross-shelf for up to two weeks. Low frequency (50 Hz - 6000 Hz) sounds recorded by these methods provide a better understanding of the diurnal and spatial distribution of known fish calls (e.g., red grouper *Epinephelus morio* and gulf toadfish *Opsanus beta*). However, this is seemingly overwhelmed by the vast number of

sounds produced by unknown species. This includes a strong diurnal 6000 Hz signal, frequent nocturnal calls, overlapping multispecies calls among other highly unusual sounds. With our recordings we are able to characterize the location and timing of these stereotyped sounds, and are able to use that information to guide our attempts to identify the sound producers.

0726 AES Physiology & Reproduction, 552 AB, Thursday 8 July 2010

Cathy Walsh, Stephanie Leggett, Carl Luer, Michael Henry

Mote Marine Laboratory, Sarasota, FL, United States

Effects of Nurse Shark, *Ginglymostoma cirratum*, Peripheral Blood Leukocytes Following in vitro Exposure to Red Tide Toxin

Blooms of the toxic dinoflagellate, *Karenia brevis*, occur almost annually off the west coast of Florida. Commonly called "red tides", these blooms produce neurotoxins, collectively termed brevetoxins (PbTx), that severely impact many species of marine mammals, sea turtles and fish. Effects on immune cells from nurse sharks, *Ginglymostoma cirratum*, were investigated following in vitro exposure of peripheral blood leukocytes (PBL) from healthy captive nurse sharks to brevetoxin. Differential expression of genes affected by brevetoxin exposure was determined through suppression subtractive hybridization (SSH) experiments. Using unexposed PBL from nurse sharks as control, SSH experiments indicated that genes involved in transporter function, translation initiation, and cell signaling were up-regulated following 18 h exposure to 560 nM PbTx-2, while genes involved in mitosis and inflammation were down-regulated. Real-time PCR conducted on a gene (transmembrane 9 superfamily member 3) coding for a protein with transporter functions exhibited significant gene up-regulation in response to 140 nM PbTx-2. Coincidentally, presence of a functional transport system in nurse shark PBL was indicated by efflux of the fluorescent dye, calcein-AM, by PBL treated with 100 nM PbTx-2 for 25 min. Finally, evidence for metabolism of xenobiotic compounds through conjugated pathways in shark immune cells was demonstrated by LC/MS detection of a glutathione conjugate, GSH-PbTx, following 3 h exposure to 50 μ M PbTx-2. This study represents the first report of the effects of brevetoxins on immune cells in an elasmobranch species and suggests that exposure to red tide toxins may have significant implications for immune function in sharks.

0335 AES Behavior & Ecology, 552 AB, Friday 9 July 2010

Hans Walters¹, Ramón Bonfil⁴, John Morrissey², Dennis Thoney³

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Movements of Sand Tiger Sharks (*Carcharias taurus*) in the Northwest Atlantic Ocean

From 2003-2006, we attached pop-up satellite tags to 16 sand tiger sharks, *Carcharias taurus*, to study movements and habitat preferences in the northwest Atlantic Ocean. Ten tags deployed off South Carolina returned data from nine males and one female. Tracks ranged from 29 - 184 days. Three tags jettisoned in state waters off New Jersey, Delaware, and Florida, respectively. Six tags jettisoned in U.S. Federal waters, and one transmitted east of the Exclusive Economic Zone. Depth data indicate several tags experienced significant drift; readings of < 0 meters were common, delaying transmissions after premature releases. Light levels enabled estimates of horizontal movements. Tag-manufacturer software provided crude location estimates, and the Kftrack program reduced location errors to produce Most Probable Tracks (MPTs) for four sharks. Males moved north after tagging, but remained off North Carolina until July before continuing northward. Three sharks moved offshore, and one remained close to shore; we estimated swimming speeds of 0.27 - 2.24 km/hr. MPTs for two males indicated their presence off New Jersey and Delaware in late September and early October, respectively. A tagged female provided the only pop-up location south of the deployment area, from on or close to shore in northern Florida in late October. Sharks spent May and June at depths of ≤ 30 meters. Most moved into deeper waters of ≤ 152 meters as summer progressed, but one shark remained at shallow depths. Ambient temperatures may influence movements, as most sharks swam deeper in response to temperatures $> 25^\circ$ C.

0431 AES Conservation & Management, 552 AB, Friday 9 July 2010

Christine Ward-Paige¹, Camilo Mora¹, Heike K. Lotze¹, Christy Pattengill-Semmens², Loren McClenachan³, Ery Arias-Castro³, Ransom A. Myers³

¹Dalhousie University, Halifax, NS, Canada, ²Reef Environmental Education Foundation, Key Largo, FL, United States, ³University of California, San Diego, CA, United States

Patterns of Shark Occurrence on Reefs in the Greater-Caribbean: A Footprint of Human Exploitation

Recent studies have documented dramatic declines in large coastal and pelagic shark populations which have been attributed to commercial fishing. However, the status of sharks in other systems such as coral reefs remains unexplored despite a long history of exploitation. We explored the contemporary distribution and sighting frequency patterns of sharks on reefs in the greater-Caribbean and assessed the possible role of human exploitation on such patterns. Historical records, range maps, and habitat suitability models indicate that sharks should be widely distributed and common throughout the greater-Caribbean. However, analysis of 76,340 underwater surveys show that sharks are largely absent on contemporary reefs; a pattern that was more pronounced with the exclusion of nurse sharks. Comparison with human population showed that, with the exception of nurse sharks, sharks occur most often in areas with low human population or where marine conservation exists. Population viability analysis suggest that the absence of sharks in the presence of humans can be explained by exploitation alone, since we found that sharks are vulnerable to even light levels of fishing pressure. Our results show that under current levels of fishing mortality even the most productive sharks are at risk. Our findings indicate that preventing the loss of sharks on reefs in the greater-Caribbean requires urgent management measures to protect sites where sharks still exist. The fact that sharks still occur in a few densely populated areas where strong fishing regulations are in place indicates the possibility of success and encourages the implementation of conservation measures.

0557 Poster Session III, Exhibit Hall D, Sunday 11 July 2010

Karen M. Warkentin¹, Camden M. Rouben¹, Marc A. Seid²

¹*Boston University, Boston, MA, United States*, ²*Smithsonian Tropical Research Institute, Balboa, Panama*

Highspeed Video Analysis of the Hatching Process in Red-eyed Treefrogs, *Agalychnis callidryas*

The described mechanism of amphibian hatching involves release of proteolytic enzymes from hatching glands on the dorsal surface of the head, which digest components of the vitelline membrane. Two phyllomedusine hylids, *Phyllomedusa trinitatis* and *Agalychnis callidryas* appear to lack hatching glands on the head surface; other phyllomedusines have not, to our knowledge been examined for hatching glands. To analyze the hatching process of *A. callidryas*, we recorded highspeed video of >80 embryos hatching. Individual eggs were removed from their clutch and placed on a stage before the camera. If necessary, they were prodded to stimulate hatching. Review of recordings revealed that characteristic vigorous movements known to occur during hatching are not the means of membrane rupture. Rather, hatching appears to be a two-stage process. In many recordings, embryos performed subtle full-body shaking and/or a few isolated mouth movements prior to membrane rupture. In some eggs, perivitelline fluid began leaking from a hole formed in front of the mouth apparently without physical contact. Other embryos pushed their snout against the membrane and it gradually protruded without vigorous movement. Typically the initial leak or snout protrusion was followed, sometimes many seconds later, by large undulations of the body and tail that propelled the embryo from the capsule. Such movements did not cause hatching if the snout had moved away from the initial hole. We hypothesize that *A. callidryas*, like some fishes, have hatching glands within the mouth and release enzymes via a behavioral mechanism as the first stage of hatching.

0550 Amphibian Ecology, 551 AB, Monday 12 July 2010

Karen M. Warkentin¹, Justin C. Touchon¹, Michael W. McCoy¹, Myra C. Hughey¹, James R. Vonesh²

¹*Boston University, Boston, MA, United States*, ²*Virginia Commonwealth University, Richmond, VA, United States*

Consequences of Hatching Timing in Red-eyed Treefrogs: Timescale, Currency and Context-dependence of Trade-offs

Across taxa, many embryos respond to changing risks and opportunities with apparently adaptive shifts in hatching timing. While immediate benefits of such shifts

are often clear, we know less about trade-offs that favor plasticity, and particularly little about long-term consequences of hatching timing and how they vary across environments. The arboreal embryos of red-eyed treefrogs, *Agalychnis callidryas*, hatch up to 30% prematurely to escape from egg-stage risks, entering ponds at different times, ages (4–7 days), sizes, and developmental stages. We assessed consequences of hatching timing in a series of experiments across different timescales and venues, varying the aquatic environmental context. Within minutes after hatching, the diel timing and synchrony of arrival in the water affect vulnerability to fish. In the day after hatching, premature hatchlings are more vulnerable to multiple predators than are full-term hatchlings. However, after a two-day exposure to aquatic predator cues early-hatched tadpoles become less vulnerable than naïve full-term hatchlings. In one factorial mesocosm experiment we found no effect of hatching age on one-month survival, with or without odonate or belostomatid predators but, with predators, early hatchlings grew faster. In another mesocosm experiment, hatching early reduced survival to metamorphosis, regardless of predator presence or resource levels, but did not affect larval period or metamorph size. Overall, the consequences of hatching early are partly context-dependent and weaken with time since hatching. We have detected both compensatory benefits and unanticipated costs, but the magnitudes of costs are small relative to the ~80% mortality reduction achieved by egg-predator-induced early hatching.

0226 Herp Ecology & Behavior, 555 AB, Saturday 10 July 2010

Mark Waters

Ohio University Eastern Campus, St. Clairsville, Ohio, United States

Lingual Luring by Viperine Snakes (*Natrix maura*)

Descriptions of lingual luring in snakes are rare and limited to a few species of New World natricines. Here, I describe lingual luring by the viperine snake (*Natrix maura*), an Old World natricine found around the western Mediterranean. Lingual luring was observed under natural conditions in a population of snakes on Mallorca, Spain. Unlike previous studies, all luring sequences were observed in adult snakes. In all instances luring was performed from an ambush position and directed towards fish swimming near the surface of the water. Lingual luring differed from chemosensory tongue flicking in both duration of tongue extension and the pattern of tongue movement. Snakes struck at fish immediately following luring and in three cases were observed capturing prey. Lingual luring in *Natrix maura* is similar to that described for *Nerodia clarkii* compressicauda and *Thamnophis atractus*. This invites questions about the origin of lingual luring in natricines. Did lingual luring arise separately in New and Old World natricines or does it represent a behavior ancestral to all natricines?

0500 Karel Liem Symposium II, Ballroom D, Friday 9 July 2010

Jacqueline F. Webb

University of Rhode Island, Kingston, RI, United States

The Joy of Fishes - Sensory Biology Meets Evolutionary Morphology

When Karel gave me the opportunity to sit in on Bio 130 as a graduate student, I didn't know how it would set the stage for my career. The lateral line system had been the realm of taxonomists/systematists on one hand, and physiologists/behavioral biologists on the other. My work evolved in an effort to bring the two together by applying those principles of comparative and evolutionary biology revealed to me by Karel's work to the analysis of the evolution of the lateral line system. I wisely followed his example and chose to look at cichlids (and other "labroids" - damselfishes, wrasses, surfperches). Early on, I showed that the diversity of trunk canal patterns in Lake Tanganyika cichlids rivals that of teleosts, and suggested that heterochrony can explain patterns of diversification in the trunk canal. The unusual trunk canal of the damselfishes *Amphiprion* and *Azurina*, which I discovered while working in the MCZ raised fundamental (and yet unanswered) questions about the developmental basis for lateral line scale meristics. After analyzing the development of the "narrow" cranial lateral line canals in two cichlids (*Oreochromis*, *Archocentrus*), my lab has turned to *Aulonocara*, a genus of Lake Malawi cichlids, and likely the only teleost with "widened" canals amenable to developmental and behavioral lab investigations. We are currently combining the morphological and functional approaches inspired by Karel by testing the hypothesis that widened canals evolved as a result of heterochrony and analyzing the role of widened canals in lateral line-mediated feeding behavior.

0755 Poster Session II, Exhibit Hall D, Saturday 10 July 2010

Nicholas Webber, Michelle Boone, Christopher Distel

Miami University, Oxford, OH, United States

Effects of Carbaryl Exposure in Aquatic and Terrestrial Life Stages of American Toads

The effects of many pesticides have been shown to alter time and size at metamorphosis, which can have impacts on terrestrial growth and survival; however, few studies have examined the effects of aquatic exposure on juveniles or the impacts of terrestrial exposure on juveniles. We examined the effects on feeding ability and survival of larval and juvenile American Toads (*Bufo americanus*) after short-term exposure to the insecticide carbaryl both in the larval and juvenile stages of life. This outdoor and laboratory experiment showed juvenile exposure had little to no effect on feeding and

survival while larval exposure led to major differences in mass at metamorphosis. Our study suggests that larval exposure may be more important than terrestrial exposure.

0339 Poster Session I, Exhibit Hall D, Friday 9 July 2010

Katrina Weber, Eli Greenbaum

University of Texas at El Paso, El Paso, TX, United States

Molecular Data Elucidate a Species Complex within Populations of *Ptychadena mascareniensis* (Anura: Ptychadenidae) in Democratic Republic of the Congo

Previous phylogenetic analyses have revealed high levels of genetic differentiation within the widespread anuran species, *Ptychadena mascareniensis*. Herein, we increase sampling of Central African populations of *P. mascareniensis* by over six times to examine their relationships to previously identified clades in East Africa, and to search for additional cryptic species. We sequenced 575 bp of one mitochondrial (16S) gene and 935 bp of one nuclear (RAG1) gene from 40 DRC specimens tentatively identified as *P. mascareniensis* and two outgroups (*Hildebrandtia* and *Phrynobatrachus*). Our 16S sequences were combined with a previously available dataset (143 total sequences) and analyzed with maximum-likelihood and Bayesian inference criteria using the programs GARLI and MrBayes. The results corroborate previous findings, indicating the presence of five genetically distinct clades distinguished by an uncorrected pairwise divergence greater than 5%, which has previously been used to distinguish evolutionary lineages within this group. Three of the five clades were represented by specimens collected in the DRC, with the exception of a clade encompassing Madagascar, the Seychelles, and the Mascarenes (the type locality for *P. mascareniensis*) and a clade restricted to West Africa. Two clades occur in East Africa and include DRC specimens that show evidence of spatial segregation, with one taxon collected mainly in savannah habitat, whereas the other was found in forested areas. The clade containing forest species provides evidence of biogeographic connections between eastern DRC and the western forests of Kenya and Uganda. Our study confirms and expands previous assertions that taxonomic diversity within *P. mascareniensis* is underestimated.

0465 Poster Session III, Exhibit Hall D, Sunday 11 July 2010

Matthew Weeg¹, Jacqueline Grant², George Samra²

¹*The Pennsylvania State University, Altoona, PA, United States*, ²*The Pennsylvania State University, University Park, PA, United States*

Effects of Elevated Salinity on the Morphology and Behavior of Green Frog Tadpoles

Road deicing salts contaminate runoff and increase salinity of roadside ponds, which directly and indirectly affects tadpole mortality. High salinity causes tadpole mortality, but less is known about how sub-lethal salt concentrations affect tadpole behavior. Tadpoles exhibit a characteristic escape response that is mediated by a sensory system (the lateral line) that detects water movement. Normal lateral line function is dependent upon ion concentrations in the surrounding water. We predicted that exposure to salt would interfere with escape behaviors through disruption of lateral line function. To test this, we exposed tadpoles to freshwater or sub-lethal salt concentrations (200mg/L or 800 mg/L NaCl) and measured escape behaviors elicited by water jets. We then compared swimming distance across the three experimental groups. Tadpoles in all three treatment groups exhibited escape responses, although there were differences in the behavioral metrics we measured. Tadpoles exposed to both low (200mg/L) and high (800 mg/L) salt concentrations swam significantly shorter distances than controls. Tadpoles in the high salt group were significantly larger than those in the low salt and control groups. These results suggest that exposure to sub-lethal salt concentrations reduces anti-predator escape behaviors, making tadpoles more susceptible to predation attempts. It is likely that salt exposure disrupts the lateral line system, thus decreasing the tadpole's ability to detect and respond to water currents produced by a predator. This represents an indirect effect of salt on tadpole mortality, and suggest that road salts may pose a serious ecological threat to amphibian populations, even at sub-lethal concentrations.

0662 SSAR SEIBERT SYSTEMATICS & EVOLUTION/SSAR SEIBERT PHYSIOLOGY, 555 AB, Friday 9 July 2010

Denita M. Weeks, Robert E. Espinoza

California State University, Northridge, Northridge, California, United States

Geckos on Ice: Unexpected Thermal Tolerances and Temperature-dependent Performance of the World's Southernmost Gecko

Although most geckos are nocturnal and live in tropical climates, *Homonota darwinii*—the world's southernmost gecko—occurs as far south as 52 °S. The southern range of *H.*

darwinii is often cold during the activity season, so climate likely imposes a thermal challenge for this species. We tested the general hypothesis that several aspects of the thermal biology of this widespread species match its thermal environment over its broad latitudinal range. We predicted that the species would exhibit the greatest thermal mismatch to local thermal conditions in the coolest environments that species occupies. We measured the thermal tolerances (critical thermal minimum, CT_{min} and panting threshold, PT) and temperature-dependent sprint performance (10, 15, 25, 35, and 40 °C) of four populations of *H. darwinii* spanning the latitudinal range of this species. CT_{min} differed across populations, but not latitudinally as anticipated. Remarkably, some populations had subzero CT_{min} s indicating supercooling—the first time this phenomenon has been reported for any gecko. PTs did not differ among populations. Our sprint data indicate similar shifts in temperature-dependent performance over the range of *H. darwinii*. The lower tolerances for cold suggest that some populations experience substantially cooler temperatures during the activity season, which will be tested with microclimate data collected from each site. Our long-term goal is to incorporate these and temperature-dependent metabolic data into a biophysical model that will estimate the future distribution of this lizard following predicted changes in regional temperature.

0655 AES Physiology & Reproduction, 552 AB, Thursday 8 July 2010

Nicholas Wegner¹, N. Chin Lai², Kristina Bull¹, Jeffrey Graham¹

¹*Scripps Institution of Oceanography, La Jolla, CA, United States*, ²*University of California, San Diego, La Jolla, CA, United States*

Ram Ventilation in the Shortfin Mako, *Isurus oxyrinchus*: Examining Oxygen Utilization and the Branchial Pressure Gradient Using a Large Water Tunnel

This paper investigates aspects of ram ventilation in a lamnid shark, the shortfin mako, *Isurus oxyrinchus*, and examines the extent to which intrinsic structural differences in the gill design of elasmobranchs and teleosts may affect the lamnid-tuna convergence for high-performance swimming. The study of makos swimming in a water tunnel demonstrates that, despite differences in gill design, mouth gape, and basal swimming speeds, O_2 utilization at the gills and the pressure head driving branchial flow for makos are similar to values reported for tunas. Also comparable to tunas are estimates of both the velocity and the residence time of water in the interlamellar channels of the mako. However, mako and tuna gills differ in the sites of primary branchial resistance. In the mako, much of the total branchial resistance resides with the septal channels, structures inherent to the elasmobranch gill and not present in tunas. The added resistance at this location is compensated by a correspondingly lower resistance at the gill lamellae, which is accomplished through wider interlamellar channels. Although greater interlamellar spacing minimizes branchial resistance, it also limits lamellar number and results in a lower total gill surface area for the mako relative to tunas. The elasmobranch gill design

thus appears to constrain gill area and may potentially limit mako aerobic performance in comparison to tunas.

0617 Poster Session I, Exhibit Hall D, Friday 9 July 2010

Tiffany A. Weidner, Amy C. Hiron, David W. Kerstetter

Nova Southeastern University Oceanographic Center, Dania Beach, FL, United States

Combined Gut-Content and Stable Isotope Trophic Analysis of the Pelagic Stingray (*Pteroplatytrygon violacea*) from the Western North Atlantic Ocean

The understanding of an organism's trophic level is vital to understanding the impact that a specific organism has on the ecosystem, and trophic relationships are vital for correctly modeling ecosystems and ecosystem effects of fisheries removals. The pelagic stingray is found in sub-tropical and tropical waters worldwide and is thought to inhabit the epipelagic zone of the ocean based on fishery catch records. The species is a common bycatch in the Atlantic pelagic longline fishery, yet its ecological role is poorly understood. Very few studies have been done on the diets of the pelagic stingray, most with low sample sizes. For this work, 124 specimens (63 males and 61 females) were collected during commercial pelagic longline fishing operations in the U.S. South Atlantic Bight between August 2008 and December 2009. Stomachs were fixed in formalin, then dissected and the contents quantified to the lowest taxonomic level. Preliminary dissections have shown the major dietary items are crustaceans (40%) and mollusks (30%), in contrast to previous studies from the Pacific, which found mollusks (50%) to be the dominant prey item, followed by Actinopterygian fishes (19%) and crustaceans (17%). Due to the span of collection time, diet distributions between seasons, between sexes, and length were addressed. Comparisons have shown little differences between diets of males and females or diets between seasons. In addition, stable isotope analysis of $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ was performed on white muscle and liver tissues to correlate trophic feeding level data from the gut-content analysis.

0257 Poster Session I, Exhibit Hall D, Friday 9 July 2010

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Species Boundaries in Philippine Bent-toed Geckos (Gekkonidae: *Cyrtodactylus*)

The Philippine archipelago is considered a biodiversity hotspot, characterized by high levels of vertebrate diversity and endemism. Analyses of morphology and mitochondrial gene sequences demonstrate that species diversity in the genus *Cyrtodactylus* has previously been underestimated, and is in need of taxonomic review. Morphological and genetic divergence within "widespread" species allows us to enumerate several distinct evolutionary lineages that are undoubtedly valid species. These new taxa are single-island endemics, or are occasionally confined to particular geological components of larger islands. We interpret this newly defined species diversity in light of the unique geological history of the archipelago and we suspect that numerous additional species await discovery. Taxonomists should continue being attentive to "widespread" species, specifically those in the northern portions of the archipelago, which can be expected to harbor multiple distinct evolutionary lineages. Only by comprehensively evaluating the widespread species complexes, will the true extent of diversity within Philippine *Cyrtodactylus* be fully realized.

0696 Lundberg Symposium, Ballroom D, Sunday 11 July 2010

Mark Westneat

Field Museum of Natural History, Chicago, IL, United States

Creative Ichthyological Research and the Holy Trichotomy: Phylogenetics and Functional Morphology Inspired by John Lundberg

Late last millennium, an eclectic group of rogue biologists formed the influential clandestine organization DUCCIS, the Duke University Center for Creative Ichthyological Studies. Led by JGL, this shadowy entity infiltrated freshwater and marine habitats throughout the world, surveying, measuring, and consuming fishes of every size, shape, and culture. This program of piscine intrigue was directed toward investigating the heritage of various US and international fish groups, as well as publishing propaganda regarding the alleged associations within the innocent ichthyocommunity of structure, function, and ecology. It was a highly creative time during which JGL fomented the integration of radical ideas such as morphometrics, biomechanics, homology, and various mechanisms of outgroup rooting, which took

hold among his ichthyocolytes and shaped the systematic agenda of droves of operatives now functioning at all levels of academia. This report uncovers the white, slimy underbelly of this controversial period in ichthyology, and highlights some of the recent activities of a Chicago arm of this sinister network involved in such questionable activities as molecular phylogenetics of coral reef fishes, analyses of morphometrics and jaw function in fishes, and the bizarre concatenation of hundreds of published evolutionary trees of fishes into a single large, pretentious phylogenetic megatree of all fishes. Evidence suggests that the visualization of such large megatrees and online integration of data on fishes may be a secret plot by these ichthyophiles to provide a rapid means of exploring the evolution of structure, function and ecology to a wide community of scientists and the general public.

0706 Poster Session II, Exhibit Hall D, Saturday 10 July 2010

Mark Westneat, John Lundberg

Field Museum of Natural History, Chicago, IL, United States

A MegaTree for all Fishes: A Higher-Level Framework for Vertebrate Evolution II

Aggregation of biodiversity information is happening at a massive scale, often faster than we can organize and visualize the data for informative patterns. A large phylogenetic framework is a useful way to organize and visualize information, with new tools such as the EOL and MorphBank being developed to empower the searching of large trees for evolutionary trends, diversification rates, character correlations, data richness, and the literature. Large phylogenies are powerful heuristic tools for data exploration and are informative for both research and education long before every node is supported by detailed character data (and in fact can be used to highlight areas in need of new data). Here we present a second edition of our MegaTree of all families of fishes, with most groups resolved according to classical or recent hypotheses of relationships. The phylogeny contains over 800 fish families, both fossil and living, with taxonomy derived from Eschmeyer and Nelson. The phylogeny is dynamic, flexible, and subject to simultaneous manipulation by multiple users. It is freely available as a Mesquite file for editing and use by the community. Group effort is needed in the resolution of family name lists, the application of published phylogenies to the hierarchical structure of the tree, and the splicing in of more fully resolved phylogenies at the species level. Tree splicing or grafting, to produce MegaTrees, is available in a workflow using tools such as PhyloGrafter, that will enable the ichthyological community to make a MegaTree of all fish species using the current backbone.

0523 AES Behavior & Ecology, 551 AB, Saturday 10 July 2010

Bradley Wetherbee¹, Joseph Marini¹, Kevin Fung¹, Mahmood Shivji², Richard Nemeth³, Jeremiah Blondeau³, Elizabeth Kadison³

¹University of Rhode Island, Kingston, Rhode Island, United States, ²Nova Southeastern University, Fort Lauderdale, Florida, United States, ³University of the Virgin Islands, St. Croix & St. Thomas, Virgin Islands, U.S.

Interactions Among Three Species of Sharks and Grouper Spawning Aggregations in the US Virgin Islands

Grouper spawning aggregations along deep reefs of the US Virgin Islands represent a large potential prey source for large predators including sharks. To examine the relationship between grouper spawning aggregations and sharks, we tagged three species of sharks with acoustic transmitters and monitored their movements over several years using an array of receivers deployed at spawning sites and at locations spanning a stretch of deep reef approximately 100 km in length between the US Virgin Islands and Puerto Rico. Each species of shark demonstrated different behavioral patterns, with temporal and spatial patterns of movement of one species closely associated with spawning events, but little connection between spawning aggregations and behavior of the other two species of sharks. Lemon sharks (*Negaprion brevirostris*) were present at the spawning sites at a much higher frequency during the spawning season, but largely absent during non-spawning months. Caribbean reef sharks (*Carcharhinus perezi*) moved little throughout the year and were detected on receivers in proximity to spawning sites almost continuously. Tiger sharks (*Galeocerdo cuvier*) were detected on receivers throughout the year along the entire extent of the array of receivers and showed no obvious movement patterns associated with spawning activities and little consistency among individuals. Our findings illustrate variable interactions that may occur between different species of sharks and grouper spawning aggregations and that prey availability may influence the spatial and temporal patterns of activity of co-occurring species of sharks in different ways.

0434 AES Behavior & Ecology, 552 AB, Friday 9 July 2010

Bradley Wetherbee¹, Mahmood Shivji², Guy Harvey³, Neil Burney⁴, Choy Aming⁴

¹University of Rhode Island, Kingston, RI, United States, ²Nova Southeastern University and Guy Harvey Research Institute, Ft. Lauderdale, FL, United States, ³Guy Harvey Research Institute, Ft. Lauderdale, FL, United States, ⁴Bermuda Shark Project, Bermuda, Bermuda

Movements and Habitat Use of Tiger Sharks (*Galeocerdo cuvier*) Revealed by Tracking with Satellite Transmitters, the Bermuda-Bahamas Connection

Movements and habitat use of tiger sharks (*Galeocerdo cuvier*) vary among locations and describing behaviors that apply to major demographics the tiger shark populations is challenging. Tiger sharks are common inhabitants of deep reefs off Bermuda during summer months, but are thought to leave in fall and exhibit a seasonal movement cycle. We tagged tiger sharks in Bermuda in late summer with fin-mounted "spot" satellite transmitters (n=9) and archival popup satellite transmitters (n=7) to investigate movement patterns and habitat use of these sharks. Sharks generally remained near Bermuda until fall, when they made directed southeastern movements of 1-2 weeks duration and 1300-1700 km until reaching the Bahamas or Lesser Antilles. The sharks spent the winter months moving within relatively small areas, at times very close to shore. Several individuals exhibited more pelagic behavior remaining farther from shore in deep water. Sharks spent the majority of their time in the uppermost portion of the water column in water greater than 26°C. Monitoring of these sharks continues with the goal of documenting their movements as summer approaches with a possible return to Bermuda. Tiger sharks tagged in Bermuda demonstrate relatively consistent behavior occupying a northern summer habitat and migration to a southern wintering area over 1000 km distant. The results of our study support the contention that tiger sharks are highly mobile apex predators that connect widespread insular and pelagic habitats within the Western North Atlantic.

0075 Roads Symposium I, Ballroom B, Saturday 10 July 2010

Patricia A. White

Defenders of Wildlife, Washington, DC, United States

Keynote: Road Planning 101

Transportation planning guides decisions that influence the location, direction and shape of the development that happens tomorrow and hence the location, types and quality of habitat that we are able to protect. The bad news is, the transportation

planning process is complicated, obtuse and a bit overwhelming. At any given time, several simultaneous processes, plans and products are in play. The good news is, recent advances in transportation planning have created roles for natural resource professionals and the variety of data and information necessary for conservation. The transportation planning process provides an opportunity to voice concerns early enough to actually avoid many impacts. By the time a bad road plan gets to the project stage, all we can do is minimize and mitigate the harm. Proactive transportation planning to maintain and increase habitat connectivity, public education and communication among professional sectors of society are the most economical and effective means to find ways to minimize, mitigate, and even prevent road impacts. This session will provide an overview of the transportation planning process with specific instruction on where and how natural resource professionals can most effectively incorporate conservation into long-range transportation plans. Using modern data and mapping technologies, we can virtually hardwire natural resource conservation into the transportation planning process.

0169 SSAR SEIBERT ECOLOGY AWARD, 555 AB, Thursday 8 July 2010

Steven Whitfield¹, Jacob Kerby², Lydia Gentry³, Maureen Donnelly¹

¹Florida International University, Miami, Florida, United States, ²University of South Dakota, Vermillion, South Dakota, United States, ³University of Idaho, Moscow, Idaho, United States

Temporal Variation in Prevalence and Intensity of Chytridiomycosis in Three Species of Frogs at La Selva, Costa Rica

The emerging infectious disease chytridiomycosis, caused by the chytridiomycete fungus *Batrachochytrium dendrobatidis* (*Bd*), is implicated in widespread amphibian population declines. In the neotropics, most declines have occurred in elevations over 400m asl, in theory because *Bd* is intolerant to higher temperatures in lowland tropical forests. However, the lowland (<140m) La Selva Biological Station, in Costa Rica, has experienced gradual yet significant population declines over the past three decades. Here, we report results of a 12-month disease surveillance program at La Selva for three common species of frogs that vary in their dependence on aquatic habitats. We combine skin swabbing with a qPCR assay to analyze prevalence and *Bd* load across a year. Prevalence overall is low (~6% of frogs at the site infected). There was dramatic temporal variation in the prevalence of *Bd* (ranging from <1% in several months to a peak of ~18% in January), yet no temporal variation in *Bd* load. Prevalence was strongly negatively correlated with air temperature. There was no difference among species in prevalence despite variation in life histories, suggesting that *Bd* infection is not limited to those species with aquatic life stages. Our data indicate that *Bd* can attain relatively high prevalence even in lowland forests, and that lowland forests should not necessarily be considered unsusceptible to *Bd*-associated declines. However, because high temperatures do appear to limit prevalence of *Bd*, our study does provide support for

the hypothesis that regulation of *Bd* by temperature limits widespread extinctions to cooler montane regions.

0698 AES Behavior & Ecology, 551 AB, Saturday 10 July 2010

Nicholas Whitney¹, Harold Pratt², Theo Pratt², Jeffrey Carrier¹

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It's 3 A.M., Do You Know What Your Shark is Doing? Fine-scale Ethograms from Accelerometers

Although acoustic and satellite telemetry techniques have greatly enhanced our ability to track shark position and depth, the actual behavior of the animal cannot be determined from broad movement data. We applied three-dimensional acceleration data-loggers to six adult nurse sharks (*Ginglymostoma cirratum*) in the Florida Keys to provide the first fine-scale ethograms for sharks in the wild. Data-loggers were deployed for periods of 23 to 104 h (59 + 35 h, mean + SD). Four of the six animals were simultaneously tagged with coded acoustic transmitters to acquire the sharks' location from an array of acoustic receivers, and two sharks carried depth/temperature loggers to provide additional context to acceleration and location data. Behaviors such as swimming, resting, diving, fast-starts, rolling associated with mating, and other behaviors were identifiable and quantified on a per-second basis. Of the two animals with depth loggers, one showed repetitive diving behavior between the surface and 20-32 m for 33 h after tagging. Accelerometer data showed changes in body posture associated with diving and ascending, and indicated that the shark would occasionally rest on the bottom for several minutes between dives. The animal returned to shallow (< 3 m) water for the final 16 h of the track and mated repeatedly during this time. Thirty-seven of 53 (70%) mating events took place during the day, with only 2 (3.7%) events between the hours of 22:00 and 05:00. No events occurred in water deeper than 4 m, and nearly all were in 2 m or less.

0740 Headstarting Turtle Symposium I, Ballroom B, Monday 12 July 2010

Thane Wibbels

University of Alabama at Birmingham, Birmingham, Alabama, United States

Temperature-Dependent Sex Determination: Implications for Turtle Conservation Programs Using Egg Hatcheries and Head-starting

A variety of reptiles possess temperature-dependent sex determination (TSD). This form of sex determination has significant implications for the ecology, evolution, and conservation of these species. Conservation programs that include head-starting and/or egg hatcheries must address a variety of questions regarding TSD when attempting to develop optimal conservation strategies. As examples: 1) What is the effect on sex ratio when you move eggs from in situ nests to an egg hatchery, and what sex ratio should you produce in the egg hatchery? 2) Should you try to duplicate the natural sex ratio or should you manipulate the sex ratio? 3) If you decide to produce a specific sex ratio, what temperatures should you use? That is, should you incubate all eggs at a temperature that would potentially produce the desired sex ratio or should you incubate a proportion of the eggs at a male-producing temperature and the remainder at a female-producing temperature? 4) How is temperature affecting sex, and are certain temperatures better for producing a given sex? The purpose of this presentation is to provide insight on these basic questions by drawing from data and conclusions from a wide variety of studies. Our current state of the knowledge is not conclusive, however, it provides insight and specific examples which can facilitate the development of effective management strategies in head-start programs for turtles with TSD. Such strategies can take advantage of TSD in order to enhance the conservation of turtles.

0576 Herp Systematics, 551 AB, Monday 12 July 2010

John Wiens¹, Caitlin Kuczynski¹, Ted Townsend², Tod Reeder², Dan Mulcahy³, Jack Sites³

¹Stony Brook University, Stony Brook, New York, United States, ²San Diego State University, San Diego, California, United States, ³Brigham Young University, Provo, Utah, United States

Combining Phylogenomics and Fossils in Higher-level Squamate Phylogeny: Molecular Data Change the Placement of Fossil Taxa

Molecular data offer great potential to resolve the phylogeny of living taxa, but can molecular data improve our understanding of the relationships among fossil taxa? Simulations suggest that this is possible, but few empirical examples have demonstrated the ability of molecular data to change the placement of fossil taxa. We offer such an

example here. We analyze the placement of snakes among squamate reptiles, combining published morphological data (363 characters) and new DNA sequence data (15,794 characters, 22 nuclear loci) for 45 living and 19 fossil taxa. We find several intriguing results. First, some fossil taxa undergo major changes in their phylogenetic position when molecular data are added. This suggests that it may be problematic to assume that fossil taxa can be placed in a molecular phylogeny based on their placement in analyses of morphology alone (as often done in analyses of divergence-time estimation). Second, most fossil taxa are placed with strong support in the expected clades by the combined-data Bayesian analyses, despite >98% missing data cells each and recent suggestions that extensive missing data are problematic for Bayesian phylogenetics. Third, morphological data can change the placement of living taxa in combined analyses, even when there is an overwhelming majority of molecular characters. Finally, we find strong but apparently misleading signal in the morphological data, seemingly associated with a burrowing lifestyle in snakes, amphisbaenians, and dibamids. Overall, our results suggest promise for an integrated and comprehensive Tree of Life by combining molecular and morphological data for living and fossil taxa.

0120 AES Stress Symposium II, 551 AB, Sunday 11 July 2010

Rachel Wilborn¹, Wayne A. Bennett¹

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Effects of Exhaustive Exercise on Juvenile and Adult Stingrays, *Dasyatis sabina*

Physiological responses to exhaustive exercise provide insight into swim performance limits in fish, and potentially highlight ontogenetic differences between adults and juveniles of the same species. Metabolic responses to swim exhaustion (i.e., oxygen consumption, ventilation rates, and blood lactate) were quantified in juvenile and adult Atlantic stingrays (*Dasyatis sabina*). Adult stingrays were significantly larger and heavier than juveniles (Independent T-test, $P < 0.01$) providing a definitive comparison. A direct correlation between body size and metabolism was found for many parameters measured. Adult stingray oxygen consumption rates were 3-fold greater than juvenile rates pre-exhaustion (0.0339 and $0.0127 \text{ mg g}^{-0.67} \text{ hr}^{-1}$ respectively) and 4-fold greater post-exhaustion (0.0391 and $0.0094 \text{ mg g}^{-0.67} \text{ hr}^{-1}$ respectively). However, pre- and post exhaustion ventilation rates were not significantly different between life stages. Adult hematological lactic acid values post-exhaustion were 150% greater than juveniles (0.9899 mmol/L and 0.6418 mmol/L). Metabolic adjustments to exhaustive swimming (i.e., escape responses) may impact overall survival strategies as related to predator avoidance tactics, habitat selection, and utilization.

0032 AES Conservation & Management, 552 AB, Friday 9 July 2010

Tonya Wiley¹, Shelley Norton², John Carlson³, Amanda Frick²

¹*Texas Parks and Wildlife Department, Coastal Fisheries Division, Dickinson, Texas, United States,* ²*NOAA Fisheries Service, Southeast Regional Office, Protected Resources Division, St. Petersburg, Florida, United States,* ³*NOAA Fisheries Service, Southeast Fisheries Science Center, Panama City Laboratory, Panama City, Florida, United States*

Designating Critical Habitat for the Endangered Smalltooth Sawfish *Pristis pectinata* in the United States: Challenges and Results

On April 1, 2003, the U.S. distinct population segment (DPS) of smalltooth sawfish (*Pristis pectinata*) was listed as endangered by NOAA Fisheries Service. At the time of listing, very little information was known about the habitat usage patterns for this species; therefore, critical habitat could not be determined. Following the listing studies necessary for the identification of specific habitats and environmental features important for the conservation of the species were conducted. Facilitating recruitment into the adult population by protecting the species' juvenile nursery areas was identified as the key conservation objective for the species that would be supported by the designation of critical habitat. The location of potential nursery areas was determined through applying a model developed for identifying elasmobranch nursery areas to smalltooth sawfish encounter data. The habitat features essential to the conservation of the species (also known as the essential features) were identified as red mangroves and shallow euryhaline habitats characterized by water depths less than ~ 1.0 m. These essential features are necessary to facilitate recruitment of juveniles into the adult population by providing for potential predator avoidance and habitat for prey. Two specific areas located along the southwestern coast of Florida between Charlotte Harbor and Florida Bay which contain nurseries and the essential features were designated as Critical Habitat. The Charlotte Harbor Estuary Unit comprises approximately 221,459 acres (346 mi²) of coastal habitat; and the Ten Thousand Islands/Everglades Unit (TTI/E) comprises approximately 619,013 acres (967 mi²) of coastal habitat.

0512 HERPETOLOGISTS' LEAGUE GRADUATE STUDENT AWARD, 556 AB, Friday 9 July 2010

Lisabeth Willey¹, Paul Sievert¹

¹University of Massachusetts Amherst, Amherst, MA, United States, ²USGS, Massachusetts Cooperative Fish & Wildlife Research Unit, Department of Natural Resources Conservation, University of Massachusetts, Amherst, MA, United States

Multi-scale Habitat Analysis of Eastern Box Turtles (*Terrapene c. carolina*) in Central Massachusetts

Resource selection can be viewed as occurring in a hierarchical fashion, at the order of the region, population, home range, and resource. Our objective was to determine which factors influence the distribution of Eastern box turtles (*Terrapene c. carolina*) at various levels of resource selection in the Connecticut River Valley in Massachusetts, where they are a Species of Special Concern. By comparing remotely sensed geologic, topographic, and land-use characteristics at known over-wintering locations with those at random points, using logistic regression and classification and regression trees (CART), we characterized box turtle habitat at the regional, population, home-range, and daily habitat selection levels. Results from our models can be used to inform management and regulatory decisions and to aid in the selection of sites for future survey and conservation efforts. Importance of habitat variables changed from the broadest (regional) to finest (daily movement) level, with topographical features (elevation and slope) being most important at the regional level, sand and percent cover at the lifetime level, percent forest and aspect at the annual home-range level, and no remotely measured variables were important at the daily movement level. Box turtles were generally associated with highly forested areas near open habitat and southwest aspect, low slope and elevation at the regional and lifetime movement levels, but they were associated with higher elevations and more northern aspects than generally available at the home range level. Logistic regression and classification trees produced similar results, but had different strengths in predicting and describing box turtle habitat.

0384 Karel Liem Symposium, Ballroom D, Thursday 8 July 2010

Cheryl Wilga

University of Rhode Island, Kingston, RI, United States

Twenty Years of Shark Research Championed by Karel

Karel Liem has had a great impact on my research career from my undergraduate research to my recent appointment at the MCZ. Spiny dogfish research at FHL was the first of a series of studies focused on understanding the evolution of the morphology

and mechanics of feeding mechanisms in elasmobranchs. The studies showed that sharks are not stereotypical predators but have a variety of feeding mechanisms associated with an astounding diversity of morphologies for group containing so few species. Fluid dynamics studies have revealed the effects of some of the various mechanisms for feeding on the surrounding environment. Batoids and sharks take advantage of the environment to manipulate fluid flow in remarkable ways to capture prey and locomote. Sharks take advantage of current flow to gain lift at the head to counter the downward pitch at the head induced by the heterocercal tail. Consequently, one of the most unexpected results is that the pectoral fins are used to alter body pitch, roll and yaw rather than lift production during steady forward swimming. Chondrichthyans have more jaw suspension types than any other vertebrate group and are accompanied by the evolution of various combinations of passive and active support by ligaments and muscles in various groups. This has led to a fundamental difference in the suction feeding mechanism between actinopterygians and elasmobranchs as well as divergence of feeding mechanisms within elasmobranchs. Current research shows variation in the coordination of capture and processing mechanisms with ventilation in elasmobranchs.

0383 AES Feeding Symposium I, 552 AB, Saturday 10 July 2010

Cheryl Wilga¹, Ashley Stoehr¹, Danielle Duquette²

¹*University of Rhode Island, Kingston, RI, United States*, ²*University of New Hampshire, Durham, NH, United States*

Biomechanics and Ecology of Feeding in Elasmobranchs

The feeding behavior of sharks and skates is compared to investigate suction and bite mechanisms. Suction flow is generated by rapid expansion of the oropharyngeal cavities to pull prey into the mouth. In contrast, bite feeders simply grasp the prey between the jaws. Three species are compared: bamboo sharks are specialized suction feeders; little skates are specialized for grasping; and spiny dogfish are generalist suction and bite feeders. The movement of oropharyngeal structures and pressure in the buccal, hyoid and pharyngeal regions were quantified using sonomicrometry and transducers. Regressions and ANOVA's were used to test the relationship between kinematics and pressure. Bamboo sharks, which have the smallest change in gape area and a large change in hyoid area, generate the greatest oropharyngeal pressures at fast rates of change in hyoid area. Little skates have the largest change in gape area and smallest change in hyoid expansion and consequently generate the weakest pressure with the slowest rate of change in hyoid expansion. Dogfish have an intermediate change in gape area and a large change in hyoid area, but generates intermediate pressure at fast rates of hyoid expansion. Bamboo sharks are benthic ambush predators that take prey from complex reef environments where strong suction is an advantage. Skates are also benthic ambush predators that grab prey after trapping it against the substrate with the fins;

therefore rapid jaw movements and suction are not crucial. Dogfish use ram to overtake benthic and pelagic prey and a combination of suction and biting for capture.

0245 AES Physiology & Reproduction, 552 AB, Thursday 8 July 2010

L. Jay Williams, James Sulikowski

University of New England, Biddeford, ME, United States

The Use of Steroid Hormone Concentrations to Determine Individual Variability in the Reproductive Cyclicity of the Little Skate, *Leucoraja erinacea*, from the Western Gulf of Maine

Many elasmobranch species including the little skate, *Leucoraja erinacea*, have suffered declines in population biomass. Recent studies (2007 & 2009) indicate little skate populations are recovering, but the current biomass remains substantially lower than historic levels. In order to effectively manage an elasmobranch species it is crucial to understand the reproductive biology. A promising non-lethal technique to assess reproductive parameters is the use of circulating steroid hormones. However, high variability amongst individuals has limited the ability to clearly interpret correlations between steroid hormones and reproductive cyclicity in some species suggesting the need to refine this technique. Thus, the goal of my study is to use circulating steroid hormones to define the reproductive cyclicity and degree of individual variability in the continuously breeding little skate from the western Gulf of Maine. From September 2008 to 2009 weekly blood samples were collected from a laboratory population of mature little skates and analyzed for circulating levels of E α , T, and P α , by radioimmunoassay. Preliminary E α results indicate a high degree of variability between individuals by month (up to 1,500pg/ml) and within individuals over an annual cycle (up to 2,000pg/ml). Ideally, the results from this study can be used as a model to refine this technique and subsequent analysis in order to better elucidate the reproductive trends in the little skate and other ovoviparous elasmobranch species.

0758 Fish Conservation, Ballroom B, Friday 9 July 2010

Philip Willink¹, Eustace Alexander²

¹*The Field Museum, Chicago, IL, United States*, ²*Conservation International - Guyana, Georgetown, Guyana*

Using Fish Assemblages in Different Habitats to Develop a Management Plan for the Upper Essequibo Conservation Concession, Guyana

The Upper Essequibo Conservation Concession is a reserve in central-eastern Guyana managed by Conservation International. The region is uninhabited by people and poorly studied. The first scientific fish survey was in 2007 in conjunction with the filming of the BBC nature documentary *Lost Land of the Jaguar*. Aquatic habitats were primarily flowing water, ranging from the main channel of the Essequibo River to small forest creeks. Ponds and seasonally flooded forests were uncommon. Large predatory fishes were abundant in the Essequibo River. Fishes tolerant of low oxygen levels were common in ponds / flooded forests. There was zero similarity between the fish assemblages of the Essequibo River and inland ponds / flooded forests. The rest of the habitats and fish assemblages formed a continuum between these extremes. Although not under immediate threat, future threats to the Upper Essequibo Conservation Concession include logging, mining, and over-fishing. Because of the heterogeneous distribution of fish assemblages, and because each threat will differentially impact different habitats, a variety of management options need to be implemented in order to conserve the fish biodiversity of the Upper Essequibo Conservation Concession.

0770 Herp Conservation II, Ballroom B, Sunday 11 July 2010

John Willson¹, Michael Dorcas², Ray Snow³

¹*Savannah River Ecology Lab, Aiken, SC, United States*, ²*Davidson College, Davidson, NC, United States*, ³*Everglades National Park, Homestead, FL, United States*

Identifying Plausible Scenarios for the Establishment of Invasive Burmese Pythons in Southern Florida

The Burmese python (*Python molurus bivittatus*), a native to Southeast Asia, has been abundant in the pet trade for decades and is now firmly established in southern Florida, including Everglades National Park (ENP). This species is a long-lived, behavioral, habitat, and dietary generalist that likely threatens numerous species of native wildlife. Python populations in ENP have increased exponentially since the 1990's and the range of pythons appears to be expanding both into the Florida Keys and northward into peninsular Florida. Understanding how pythons became established will be helpful in preventing additional introductions of Burmese pythons in other parts of the United

States or establishment of similar species in Florida. In this study we evaluate the plausibility of various scenarios for the introduction and establishment of Burmese pythons in southern Florida. Specifically, we use two modeling approaches to evaluate the time of introduction and characteristics of the founder population that could have lead to the introduction and establishment of this species. First, we develop a model that uses the relationship between python capture rates over time and population size to estimate the time period for population establishment. Second, we develop a demographic age-structured population model to estimate rates of python population growth under various establishment scenarios. We discuss the plausibility of various introduction scenarios in light of our modeling results and spatial, temporal, and demographic patterns of python captures in the region.

0530 Acoustics Symposium I, Ballroom D, Saturday 10 July 2010

Maria Wilson, Eric Montie, Kenneth Mann, Peter Madsen, Magnus Wahlberg, David Mann

Aarhus University, Aarhus, Denmark

Lateral Line Detection of Ultrasound in the Gulf Menhaden

Clupeiform fish belonging to the subfamily Alosinae detect and respond strongly to intense ultrasound. This sensory modality in the members of the Alosinae is hypothesized to serve as an antipredator response to echolocating toothed whales emitting high powered ultrasonic clicks. Despite the strong responses to ultrasound, the sensory organ responsibly for ultrasound detection has not yet been identified. Clupeiform fishes are unique in that they have specialized air-filled bullae in the head associated with the ear via the bulla membrane and lateral line via the lateral recess membrane. It has been hypothesized that the utricle of the inner ear is responsible for ultrasound detection through a specialized connection to the air filled bullae-complex. Here we show that the lateral line and its connection to the air-filled bullae-complex are involved in ultrasound detection by Gulf menhaden. Mechanical manipulation of the lateral line system eliminates the ability of Gulf menhaden to detect ultrasound, but does not affect detection of a 600 Hz low frequency tone. We further show that the air-filled bullae-complex vibrates in response to ultrasound and is the transducing element in ultrasound detection. These results add a new surprising dimension to the role of the lateral line and the bullae in Gulf menhaden, as the lateral line of fish previously has been believed only to detect low frequency hydrodynamic stimuli (<100 Hz). [Supported by Oticon and Knud Højgaards Fondet].

0026 Headstarting Turtle Symposium I, Ballroom B, Monday 12 July 2010

Bryan Windmiller¹, John Berkholtz²

¹*Hyla Ecological Services, Concord, MA, United States*, ²*Zoo New England, Stoneham, MA, United States*

Nest Protection and Headstarting as Tools to Aid in the Recovery of a Declining Blanding's Turtle Population

One of the largest populations of Blanding's turtles (*Emydoidea blandingii*) in New England occurs in a suburban landscape at Great Meadows NWR in Massachusetts. This population has declined by more than 50% since 1973. Our results suggest that the greatest current threat to the population is a low recruitment rate of adults; 15 of 20 adult females captured recently were marked as adults more than 20 years ago. As management interventions, we protect Blanding's turtle nests from predation and human destruction, and headstart some of the hatchlings for a period of eight months. Thus far, we have radio-tracked a sample of 24 headstarted juveniles after release into Great Meadows. To date, survivorship from egg deposition to hatching in protected nests has been 73%, survivorship through the headstarting process has been 91%, and post-release survivorship of headstarted juveniles has been approximately 85% from release to the onset of the first winter in the wild and also 85% from the first to the second winter in Great Meadows. The above survivorship levels are considerably higher than published data or estimates for Blanding's turtle eggs and juveniles with no intervention. Additionally, headstarting has allowed us to gather data on habitat use and movement patterns of young turtles that would be otherwise difficult to obtain. We hope that nest protection, headstarting, and other monitoring, management, and outreach efforts that we have conducted with the Great Meadows Blanding's turtles will eventually result in increased recruitment and the recovery of this critical population.

0217 Poster Session I, Exhibit Hall D, Friday 9 July 2010; AES CARRIER AWARD

Megan Winton¹, Enric Cortés²

¹*Pacific Shark Research Center, Moss Landing Marine Laboratories, Moss Landing, CA, United States*, ²*National Marine Fisheries Service, Southeast Fisheries Science Center, Panama City Laboratory, Panama City, FL, United States*

SHARKGUT: A Diet Database Quantifying Shark Predation

Sharks are known to play an influential role in the food webs of marine communities. While information from single diet studies is most often limited to small geographic ranges and time periods, investigation of spatial and temporal patterns in shark resource

utilization requires long term, large-scale information. We present SHARKGUT, a shark diet database, intended to be a centralized, comprehensive archive of the entire body of shark diet literature. Designed to facilitate the retrieval and analysis of diet composition data for both predators and their prey items, the database currently contains information for 177 shark species from 27 families and over 1,700 species of prey items extracted from 418 publications spanning the years 1907 to 2007. In addition to prey types and quantitative diet indices, the database includes study region, season, and taxonomic classification of prey items, as well as sex, size, and maturity status of study specimens if available. Combining all available data into a standardized database will provide a valuable tool to scientists and resource managers investigating trophic interactions and other ecosystem processes.

0215 AES GRUBER AWARD, 551 AB, Friday 9 July 2010

Megan Winton¹, David Ebert¹, Lisa Natanson², Gregor Cailliet¹

¹*Pacific Shark Research Center, Moss Landing Marine Laboratories, Moss Landing, CA, United States*, ²*National Marine Fisheries Service, Northeast Fisheries Science Center, Narragansett, RI, United States*

Age, Growth, and Maturity of the Roughtail Skate, *Bathyraja trachura* (Gilbert, 1892), from the Eastern Bering Sea

Fishery landings of skates in Alaskan waters surpass those of all other U.S. states combined. Many skates possess life history characteristics that may make them vulnerable to exploitation; therefore, the accurate assessment of growth rates, longevity, and reproductive productivity is indispensable in developing management plans. The objectives of this study were to provide age estimates and describe growth characteristics of *Bathyraja trachura* from the eastern Bering Sea, specifically examining longevity, size and age at maturity, variation in these traits between sexes, and potential differences in growth between two marine ecosystems. Age estimates were determined using counts of vertebral bands in both unstained thin sections and those prepared using a histological method. Observed age estimates from thin sections ranged from 0 to 30 years, with a maximum age estimate of 29 and 30 years for males and females, respectively. Of the four models applied, the two-parameter von Bertalanffy growth function provided the best description of growth and generated estimates of $k = 0.078$ and $L_{\infty} = 985.7$ mm TL. No significant differences were detected between the growth of males and females. Median length and age at 50% maturity were estimated at 748.2 mm and 16 years for males and 791.9 mm and 18.6 years for females. The results of this study may indicate a latitudinal pattern in size and growth, with individuals from the eastern Bering Sea growing more slowly and reaching higher maximum ages than previously reported for specimens collected off the western coast of the United States.

0561 SSAR SEIBERT ECOLOGY AWARD, 555 AB, Thursday 8 July 2010

Samantha Wisniewski, Scott Henke

Caesar Kleberg Wildlife Research Institute, Texas A&M University - Kingsville, Kingsville, TX, United States

A Model for Brown Treesnake Risk Assessment

Brown tree snakes (*Boiga irregularis*) are a mildly venomous, rear-fanged constrictor that is native to Australasia. The brown tree snake (BTS) is now an exotic invasive causing significant economic, biological, and human health problems on Guam. Brown tree snakes have been found in the continental U.S. and risk of brown tree snake introduction will continue to increase greatly over the next 10 years due to extensive military expansion and development on Guam. We collected data for shipments leaving Guam over 3 consecutive years (2006-2008) to determine at-risk locations in the continental U.S. for BTS introduction. Known BTS locations were used with shipping and climate data in a maximum entropy approach (using program Maxent) to predict the spread of BTS over time. Locations receiving the highest number and weight of shipments from Guam which also have BTS-suitable climates are concentrated in the southern U.S., and San Diego, CA holds a particularly high risk due to the amount of shipments coming from Guam. High-risk areas are important targets for the North America Brown Tree Snake Control Team (NABTSCT) for increased public education, training and awareness of BTS as an invasive species. This study can be used as an example for analysis of potential range expansion of other invasives with climate change and human contributions to exotic species introduction.

0744 Poster Session II, Exhibit Hall D, Saturday 10 July 2010

Samantha Wisniewski¹, Scott Henke¹, Dave Britton²

¹*Caesar Kleberg Wildlife Research Institute, Texas A&M University - Kingsville, Kingsville, TX, United States*, ²*U.S. Fish and Wildlife Service, Albuquerque, NM, United States*

The North America Brown Treesnake Control Team

The North America Brown Treesnake Control Team (NABTSCT) is an advisory organization working towards preventing the introduction of the invasive brown treesnake (*Boiga irregularis*) into the continental United States. The NABTSCT was formed in 2002 as a part of the Aquatic Nuisance Species Task Force in order to facilitate communication and coordination of efforts among agencies concerning brown treesnakes. Individual snakes have been inadvertently transported as hitchhikers to Texas, Hawaii, Alaska, and Oklahoma via aircraft and cargo. The control team

emphasizes public education and awareness in high-risk areas of the continental United States to prevent brown treesnake introduction. NABTSCT believes that prevention is the best method of control, and with that in mind, the NABTSCT supports a public website, risk assessment modeling, a snake identification search engine, education materials, and rapid response to brown treesnake sightings. These tools can be used as models to design preventative control methods for other injurious wildlife species.

0453 Headstarting Turtle Symposium I, Ballroom B, Monday 12 July 2010

Maria Wojakowski, Russell Burke

Hofstra University, Hempstead, NY, United States

Using Stage-based Matrix Models to Examine and Prioritize Conservation Effort on Nesting Beaches

In 1987, Crouse et al. introduced a stage-based matrix model to examine population dynamics and conservation opportunities for loggerhead sea turtles (*Caretta caretta*) in the southeastern United States. Crowder et al. (1994) modified Crouse et al.'s seven-stage model, instead using a five-stage model to determine the impact of turtle excluder devices (TEDs) on loggerhead bycatch in southeastern US trawl fisheries. Both studies identified the importance of the large-juvenile stage in sea turtle conservation. Even small decreases in the number of large juveniles cause notable reductions in loggerhead populations. Since then, stage-based matrix models have been used to determine conservation strategies for threatened and endangered turtles, e.g. the Spotted Turtle (*Clemmys guttata*) (Enneson & Litzgus 2008), the Diamondback Terrapin (*Malaclemys terrapin*) (Mitro 2003), the Desert Tortoise (*Gopherus agassizii*) (Wisdom et al. 2000). Heppell (1998) examined matrix models for a number of different turtle species to establish trends for management efforts across taxa. We build on this work, reviewing and compiling the results of matrix models to understand turtle life history and conservation potential. Matrix models have shown that headstarting and conservation strategies focused on the hatchling stage are not as valuable as once believed (Heppell et al. 1996), yet there is also evidence for the importance of hatchling conservation efforts. We examine both claims and compare the results of matrix models designed to reflect these different conservation strategies in the attempt to give a rigorous, life history-based direction to hatchling and nesting beach conservation efforts.

0628 Fish Systematics I, Ballroom D, Monday 12 July 2010

Robert Wood, Justin Baker, Kerstin Edberg

Saint Louis University, St. Louis, MO, United States

Molecular Systematics and Population Subdivision within *Crystallaria asprella* Recently Rediscovered Populations from Missouri

The genus *Crystallaria* contains two species of darters that are collectively distributed broadly but disjunctly across eastern North America. The recent rediscovery of multiple populations of *Crystallaria asprella* in several river systems in Missouri has warranted a range wide reappraisal of genetic diversity and subdivision within these species as these populations were unavailable at the time of the last published study. Evaluation of mitochondrial and nuclear data sets for these species suggest novel patterns of genetic divergence within *C. asprella*. These data will be compared to patterns of genetic subdivision within co-distributed species of darters in an effort to gain a more complete perspective on extrinsic factors promoting population subdivision.

0146 Roads Symposium I, Ballroom B, Saturday 10 July 2010

Roger Conant Wood

The Wetlands Institute and the Richard Stockton College of New Jersey, Pomona, NJ, United States

Terrapins and Tires: A Large-Scale Community-Based Conservation Initiative in Southern New Jersey, USA

The Wetlands Institute has been compiling northern diamondback terrapin (*Malaclemys terrapin terrapin*) road kill data for two decades along the Atlantic coast of southern New Jersey. Large numbers of individuals and organizations have been involved in this activity. Our data collection is highly visible to the general public and so has generated considerable newspaper, magazine and TV coverage. We have been experimenting with various kinds of roadside terrapin barrier fences over the past six years in an effort to reduce the number of road kills during the annual nesting season. Numerous individuals, local town governments, the Cape May County Highway Department, the New Jersey Department of Transportation, and the Forsythe National Wildlife Refuge have all participated in the construction and testing of different types of barrier fences. As part of our terrapin conservation efforts, we have incubated and hatched undamaged eggs taken out of road-killed female terrapins, head-started (with the help of Stockton College, the Philadelphia Zoo, two local high schools, and a number of elementary school teachers) the resultant hatchlings for nearly a year, and then involved large numbers of school children and members of the general public in their release. In

summary, we have been gathering basic data of biological interest, while at the same time increasing public awareness about the problems that humans cause, and also involving large numbers of scientists, volunteers, schools from kindergarten to college, and non-profit and governmental organizations of various kinds in different aspects of our ongoing terrapin conservation efforts.

0037 Headstarting Turtle Symposium II, Ballroom B, Monday 12 July 2010

Roger Wood¹, Patrick Baker¹, Rosalind Herlands², John Rokita²

¹*The Wetlands Institute, Stone Harbor, NJ, United States*, ²*Richard Stockton College of New Jersey, Pomona, NJ, United States*

A Unique Long-Term Headstarting Program for the Northern Diamondback Terrapin (*Malaclemys terrapin terrapin*) in Southern New Jersey, USA

Along the coast of southern New Jersey, northern diamondback terrapins (*Malaclemys terrapin terrapin*) incur high mortality as a result of both vehicle strikes and incidental drowning in commercial crab traps. Adult females are disproportionately affected because only they are struck and killed by motor vehicles while searching for nest sites on roads that cross or are adjacent to their salt marsh habitat. Over the past twenty years, annual mortality of nesting diamondback terrapins along a 38-mile transect on the Cape May Peninsula of southernmost New Jersey has ranged from 366 to 657 (mean = 493). Since 1991, 9,359 roadkills have been recorded within our transect. Outwardly undamaged eggs have been recovered from carcasses and incubated at 30 deg. C, a temperature known to produce only females. In a typical year, 40 to 50% of these eggs produce hatchlings. The tiny terrapins are then headstarted for 10 months, by which time they attain a size equivalent to that of a 3 or 4 year old terrapin in nature, before being released into their salt marsh habitat. Pit tags, first used in 1997, now uniquely identify several thousand headstarters. In recent years, adult headstarters have returned to their release sites to nest. Estimated age at maturity of these headstarters is 8-10 years. This project is unique in that the source of all eggs for our headstarters is roadkilled females. Comparisons of hatchlings from roadkills with those from natural nests show no differences in size, weight, scute anomalies, or external markings.

**0528 General Ichthyology, Ballroom B, Friday 9 July 2010; ASIH STOYE
AWARD GENERAL ICHTHYOLOGY**

Jeremy Wright

University of Michigan, Ann Arbor, MI, United States

Comparative Toxicity of Ictalurid Catfish Venoms

Members of the North American catfish family Ictaluridae have been known to possess venom glands associated with their fin spines for over 100 years, but the chemical compositions of, and toxic effects elicited by the secretions of these glands have only rarely been subjected to rigorous study. I examined the comparative toxicity of ictalurid catfish venoms by performing injections of varying doses of venoms from over 20 ictalurid species (representing four genera) into an ecologically relevant, model predator species (*Micropterus salmoides*). Results of venom injection were coded using a newly developed toxicity index, which was used to quantitatively compare toxicity of ictalurid species' venoms. Toxic peptides responsible for the production of these effects were then preliminarily identified using SDS-PAGE analyses, which compared the protein content of venom extracts with control extracts prepared from catfish fin tissue. The toxic effects produced varied between different species' venoms, and included rapid loss of coloration, myoclonus, hemorrhage at the bases of fins, loss of equilibrium, and in some cases, mortality. SDS-PAGE analyses indicated that this variation was at least partially due to the presence of unique toxic peptides in some species and genera, though other putative toxins appear to be widespread among ictalurids. Body size and venom gland morphology were also indicated as factors influencing toxicity in North American catfishes, suggesting that large body size and concomitant release from strong predation pressure may have led to the loss of venom glands in some ictalurid lineages.

**0134 Poster Session I, Exhibit Hall D, Friday 9 July 2010; ASIH STORER
HERPETOLOGY AWARD**

Yunke Wu

Harvard University, Cambridge, MA, United States

**Color Pattern Evolution and Lineage Diversification in the Chinese Stout
Newts (Salamandridae: *Pachytriton*)**

Montane amphibians are ideal models to study lineage diversification at both spatial and temporal scales. Among other reasons, their limited dispersal ability allows independent phenotypic-trait evolution through interactions with the environment. We present a phylogenetic and phylogeographic study of the stout newts, a genus of salamanders restricted to montane streams in southeastern China. We use these data to

trace the evolutionary history of external color patterns and to understand the formation and distribution of genetic lineages under the influence of paleoclimatic variations. A mitochondrial genealogy was obtained for 24 populations that include all three described species. The unspotted color pattern that is shared by *P. labiatus* and northeastern populations of *P. brevipes* could be the result of parallel evolution. Similarly, homoplasy is likely between the nominal *P. brevipes* and *P. archospotus*, which both possess numerous black spots. Based on molecular dating estimates initial cladogeneses within *Pachytriton* occurred in the early Late Miocene, which coincides with a substantial intensification of the East Asian summer monsoon 7-10 Ma. Subsequent lineage diversifications occurred mostly after 3.6 Ma, along with further strengthening of the summer monsoon. Heavy summer precipitation cause overflows of montane streams and may promote dispersal into adjacent mountains followed by isolation and divergence. Contrasting phylogeographic patterns are found among species with hypotheses of directional expansion and/or local extinction. Single-dimensional ecological niche modeling suggests a possibly negative impact of Early Pliocene climate warming on these cold-adapted salamanders. Supported by NSF (EF-0334846, AmphibiaTree) to JH.

0012 Poster Session I, Exhibit Hall D, Friday 9 July 2010

Leren Xu, Deyuan Ou, Dongmei Yang

Guizhou University, Guiyang, Guizhou, China

Identification of Mast Cell Tryptase in Some Lower Vertebrates from China

Mast cell tryptase, an inflammatory mediator, has been considered as a specific cellular marker of mast cells in human tissues and a murine monoclonal antibody (mAb AA1), raised against human mast cell tryptase has been successfully used in an indirect immunoperoxidase method to immunostain paraffin sections. In our previous works by using the method, not only human mast cells, but also mast cells in some other mammalian species such as pig, cow, sheep, cat, rat and dog also contained tryptase have been demonstrated. In very recent years, our laboratory and other workers in China have demonstrated that mast cells in some lower vertebrates also contain tryptase in their cytoplasm. We found that the mast cells in the intestine and tongue of bullfrogs *Rana catesbeiana* and Lin et al. (2009) demonstrated that the mast cells in the digestive tract of Nile tilapia (*Tilapia nilotica*) also contained tryptase. The tryptase-positive mast cells mainly lie in lamina propria of intestine and among the mucosal epithelial cells, a few were distributed in the base of intestinal villi and around submucosal glands. The excellent cross-reaction with the mAb AA1 in bullfrog and tilapia mast cells suggested that mast cells in some lower vertebrates including amphibian and teleostean also contain tryptase and like in mammalian the neutral proteases in mast cells in lower vertebrates may play an important role in the immuno-activity. The indirect immunoperoxidase method by using mAb AA1 also can be considered as a specific method to detect mast cells in some lower vertebrate tissues.

0389 SSAR SEIBERT ECOLOGY AWARD, 555 AB, Thursday 8 July 2010

Katharine Yagi, Jacqueline Litzgus

Laurentian University, Sudbury, Ontario, Canada

The Effect of Flooding on the Spatial Ecology of Spotted Turtles (*Clemmys guttata*) in a Southern Ontario Population

Many studies have focused on the effects of anthropogenic habitat alterations on animals, but little attention has been given to the effects of rapid natural changes in habitat. The purpose of this study was to examine the effects of flooding caused by beavers on the spatial ecology of the federally endangered Spotted Turtle (*Clemmys guttata*) in an isolated bog that was historically drained for peat extraction. We examined home range size, daily distances moved, and habitat use before and after flooding. We predicted that home range sizes and movements would be greater after flooding because the increased water level made more of the bog available to the turtles.

We predicted a change in habitat use as more aquatic habitats became available post-flooding. Using radio telemetry, 19 turtles were tracked throughout their active season to determine spatial patterns during the flooded conditions. We used historical data collected by the Ontario Ministry of Natural Resources to represent Spotted Turtle spatial patterns before flooding conditions. Daily movements were significantly larger during post flooding conditions compared to pre-flood conditions. Home ranges were larger during the flooded conditions although the comparison was not statistically significant. After flooding, there was a strong preference for flooded areas and drainage ditches rather than terrestrial sites throughout the active season. Understanding the response of Spotted Turtles to a rapid change in habitat will help biologists determine the best management plan to protect critical habitat and populations of this species at risk.

0351 AES Feeding Symposium II, 552 AB, Saturday 10 July 2010

Atsuko Yamaguchi, Shinya Tanaka, Keisuke Furumitsu, Gen Kume

Nagasaki University, Nagasaki, Japan

Feeding Habits of the Fanray *Platyrrhina sinensis* (Batoidea: Platyrrhinidae) in Ariake Bay, Japan

Feeding habits of the fanray *Platyrrhina sinensis* were clarified on stomach content analyses of 334 specimens collected in Ariake Bay, Japan from 2003 to 2007. A total of 324 individuals contained food items and 10 (3.0%) were empty. Mean percentage of stomach contents weight per body weight was 0.59. Thirty-seven taxonomic levels of prey items were identified. Based on the percentage of ranking index (%RI), the most

important preys were shrimps such as *Leptochela gracilis* followed by fish and mysids. These three main prey categories collectively had a %RI value of 93.7. There were no differences between sexes in the diet composition, but the ontogenetic dietary shift was observed. Shrimps were consistently the most important prey category throughout the size classes. Meanwhile, smaller individuals actively feed on mysids, and fish constituted the substantial portion of their diet for larger individuals. The Shannon-Wiener diversity index H' (2.65) indicated that this species is a generalist, and the tendency enhanced in larger individuals.

0286 AES Morphology, 552 AB, Sunday 11 July 2010

Kara Yopak¹, Shaara Ainsley², David Ebert², Lawrence Frank¹

¹University of California San Diego, Center for Scientific Computation in Imaging, La Jolla, CA, United States, ²Pacific Shark Research Center, Moss Landing Marine Laboratories, Moss Landing, CA, United States

Skating Over the Issue: Neural Adaptations to the Bathyal Environment in Deep-sea Skates

The deep sea is a vast and still largely unexplored habitat. As neural development in fishes has been shown to reflect morphological adaptations, particularly in extreme environments, quantitative analysis of deep-sea species is potentially highly informative. Members of the family Rajidae (skates) make up a highly diverse group, comprising approximately 40% of all batoids, with 30 genera across approximately 280 species. Despite their diversity, few studies have quantified interspecific brain size (encephalization) or the relative development of major brain areas (telencephalon, diencephalon, mesencephalon, cerebellum, medulla) and discrete sub-sections of these brain structures that receive direct sensory input (e.g. optic tectum and the dorsal and medial octavolateral nuclei) in rajids. The brains of five species of deep-sea skate, *Bathyraja aleutica*, *B. parmifera*, *Raja binoculata*, *R. rhina*, *Rhinoraja interrupta*, ranging in primary habitat depth from 50m to as deep as 1,600m, were assessed and compared to the brain organization of other batoids (n=24) as well as a broad dataset of sharks and holocephalans (n=84). Trends show both strong phylogenetic patterns as well as possible ecological adaptations. Though morphologically dissimilar, pilot data suggest similar patterns of brain organization between the deep-sea members of Rajidae and the deep-sea sharks and holocephalans, such as *Etmopterus baxteri*, *Centroselachus crepidater*, and *Harriotta raleighana*, which have a relatively small telencephalon, a small, smooth cerebellum, and a large medulla, particularly the areas that receive electroreceptive and lateral line input. We hypothesize that a combination of phylogenetic and ecological pressures is contributing to brain development in these species.

0601 SSAR SEIBERT CONSERVATION AWARD, 555 AB, Friday 9 July 2010

Derek Yorks, Paul Sievert

University of Massachusetts Amherst, Amherst, Massachusetts, United States

The Importance of Lighting Levels in Design of Under-Road Passages for Freshwater Turtles

Roadways are pervasive on much of the landscape and can be significant sources of mortality for turtles. This mortality is likely a major driver of the pattern of declining turtle populations in rapidly urbanizing environments. Increasingly, under-road passages are being employed to allow a range of wildlife species to move safely between habitat patches that are bisected by roadways. In an ongoing study, the amount of available light permitted to enter through the top of experimental tunnels has emerged as a critical indicator of tunnel effectiveness. Using painted turtles (*Chrysemys picta*), we conducted behavioral trials at an outdoor field laboratory to examine the influence of varying light levels, in combination with tunnel size, on turtle movements. A total of 625 turtles were tested using a complete factorial experimental design to evaluate tunnel lighting and size effects on receptiveness of turtles to use road passage structures. Responses of turtles were analyzed both as a binomial response (success/fail), and as a continuous variable (total time for the turtle to complete the trial). Light levels evaluated were 0%, 75%, and 100% of ambient light levels, and the amount of light passing through a simulated grate in the median of a highway. Successful completion of the trial increased, while median time to complete the trial decreased, as light transmitted through the tops of tunnels increased. Our results indicate the importance of designing road passage structures that provide adequate lighting for freshwater turtles.

0281 Herp Conservation III, Ballroom B, Sunday 11 July 2010

Melissa Youngquist¹, Michelle Boone¹, Caren Helbing², Jameson Jordon², Marek Kobylarz², Nik Veldhoen², Clara Wilson¹

¹*Miami University, Oxford, OH, United States*, ²*University of Victoria, Victoria, British Columbia, Canada*

Is Timing Everything? The Effects of Carbaryl on Green Frog (*Rana clamitans*) Development and the Thyroid Hormone Axis

Recent evidence indicates that pesticide exposure can affect time to and size at metamorphosis of amphibians. Because metamorphosis is under the complete control of thyroid hormones, it is possible that pesticides affect the thyroid axis. Our object was to determine how carbaryl, a widely used insecticide, influences thyroid hormone action and development of green frog tadpoles (*Rana clamitans*). Tadpoles were reared at two

different densities and exposed to the pesticide at different developmental stages (1 mg/L carbaryl at 2, 4, 8, and 16 weeks after hatching) in outdoor 1,500 L artificial ponds. Survival, mass, and stage at 19 weeks were used to determine treatment effects on development. Tadpoles were allowed to complete metamorphosis in the lab. A molecular assay was used to determine how treatment affected expression of thyroid hormone receptors in the brain. Exposure did not affect survival. Pond density and timing of exposure did influence mass and stage. Tadpoles in low density ponds exposed at 16 weeks were larger and more developed at 19 weeks than tadpoles in other treatments. This increase in mass and development was independent of food resources in the mesocosms. Molecular analysis is expected to show a change in thyroid hormone receptor mRNA levels due to exposure at 16 weeks, as we have found in related laboratory studies. These data suggest that carbaryl can have a direct effect on development of green frogs and thyroid hormone action at later developmental stages, suggesting that this insecticide can act as an endocrine disruptor.

0266 Acoustics Symposium II, Ballroom D, Saturday 10 July 2010

Lucia Ziegler¹, Matías Arim¹, Peter M. Narins¹

¹*Sección Zoología Vertebrados, Facultad de Ciencias. Universidad de la República., Montevideo, Uruguay,* ²*Departments of Physiological Science and Ecology & Evolutionary Biology, University of California Los Angeles, Los Angeles, CA, United States*

Flexibility in the Advertisement Call of *Hypsiboas pulchellus* (Anura: Hylidae) in Response to Microhabitat Characteristics

The structure of the environment surrounding signal emission produces different patterns of degradation and attenuation potentially affecting communication. The expected adjustment in call structure to ensure signal transmission in an environment was formalized in the Acoustic Adaptation Hypothesis. Within this framework, most studies considered anuran calls as fixed attributes determined by local adaptations. However, variability in vocalizations as a product of phenotypic expression has also been reported. Empirical evidence supporting the association between environment and call structure has been inconsistent, particularly in anurans. Here we present evidence for phenotypic flexibility in the advertisement call of *Hypsiboas pulchellus*, in response to induced changes in the acoustics of their microhabitat. Males were recorded in the field in natural conditions. Microhabitat was then modified placing a styrofoam enclosure around each calling male. After calling was resumed, we recorded the calls inside the enclosure. Results from Student tests for independent samples (intra-individual variation) and paired samples (inter-individual variation) rendered similar results. All temporal variables showed significant differences, with longer call elements when the individuals were broadcasting inside the enclosure. Spectral attributes were also subject to modulation, although the magnitude and direction of these adjustments were inconsistent among males. Playback experiments within the enclosure yielded results

which rule out treatment-induced variation, highlighting the potential rôle of call flexibility on detected call patterns. Our study questions the view of fixed adaptations as the sole determinant of the match between call and environment, positing phenotypic flexibility as a key factor for the understanding of this interplay.

0562 Poster Session I, Exhibit Hall D, Friday 9 July 2010

Rodrigo Zieri, Lilian Franco-Belussi, Classius de Oliveira

UNESP - São Paulo State University, São José do Rio Preto, Brazil

Effects of Testosterone Cypionate in the Hepatic and Testicular Pigmentation of the Anuran *Eupemphix nattereri*: Morphological and Stereological Studies

In amphibians, pigmented cells appear in tegument and in lung as typical melanocytes and in spleen and liver as melanomacrophage or also known as Kupffer cells. The present study aimed at characterizing morphological and stereological patterns of pigmented cells in the liver and testis of the anuran *Eupemphix nattereri*, under effect of steroid hormone. Ten adult males, collected in Sao Paulo State, Brazil, received a 5 mg/kg dose of testosterone cypionate solving in vegetal oil during 7 days, injected in the dorsal lymph sac. Group of five animals was euthanatized after 24h and other group, after 15 days and submitted to morphological studies with light and transmission electron microscopy. The control group received only vegetal oil at the same concentration. Were analyzed 25 histological fields for each animal using an image analyzing system software (Image ProPlus, Media-Cybernetics, Inc.). In the hepatic tissue were found kupffer cells, characterized by multivesicle bodies in the cytoplasm, including large amount of melanosomes. In the testis, melanocytes-like cells are present in the interstitium, with large and irregular aspect and a great amount of intensely pigmented cytoplasm. Was observed an increase of approximately 2x in the occupied area by the pigmented cells in the liver and 4x in the testis, comparing the treatment group and the control. Between the treatments, an increase of approximately 1,8x was observed in the liver of animals euthanatized after 15 days.

0247 Herp Morphology, 556 AB, Sunday 11 July 2010

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Evolution of Miniaturized Body Size in Puddle Frogs (Anura: Phrynobatrachidae): Correlations with Osteology, External Morphology, and Reproductive Mode

Miniaturization, the evolution of tiny adult body size, has played an important role in vertebrate evolution, especially within amphibians. This study examines miniaturization in a phylogenetic context to determine if reduction in body size is correlated with evolution of novel morphologies or reproductive modes. Body size evolution is reconstructed within the species-rich sub-Saharan puddle frogs (*Phrynobatrachus*), with adults ranging in size from 12 mm to greater than 50 mm. Each of the three major clades of puddle frogs follows a trend of body size reduction; the ancestor of the puddle-frog lineage was significantly larger than the majority of extant species. Evolution of pedal webbing is highly concurrent with body size reduction, and extent of pedal webbing statistically correlates with body size. Fusion of carpal (wrist) elements—from six separate bones to four—closely follows the reduction in body size that occurred between the first major clade and the subsequent two major clades. Changes to phalangeal morphology, which include asymmetric loss or duplication of phalanges in both the forelimb and hind limb, are most commonly observed in small species. Ancestral reconstructions of reproductive mode suggest that *Phrynobatrachus* independently evolved alternative modes at least seven times, including terrestrial deposition of eggs and terrestrial, non-feeding larvae. Alternative reproductive modes occur within both miniaturized and non-miniaturized species. Miniaturization has played an important role in the evolutionary radiation of this Afrotropical lineage and has been a key factor in their successful diversification across sub-Saharan Africa. Supported by NSF (EF-0334846, AmphibiaTree) to JH.
